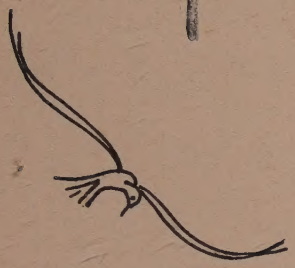
7(3)

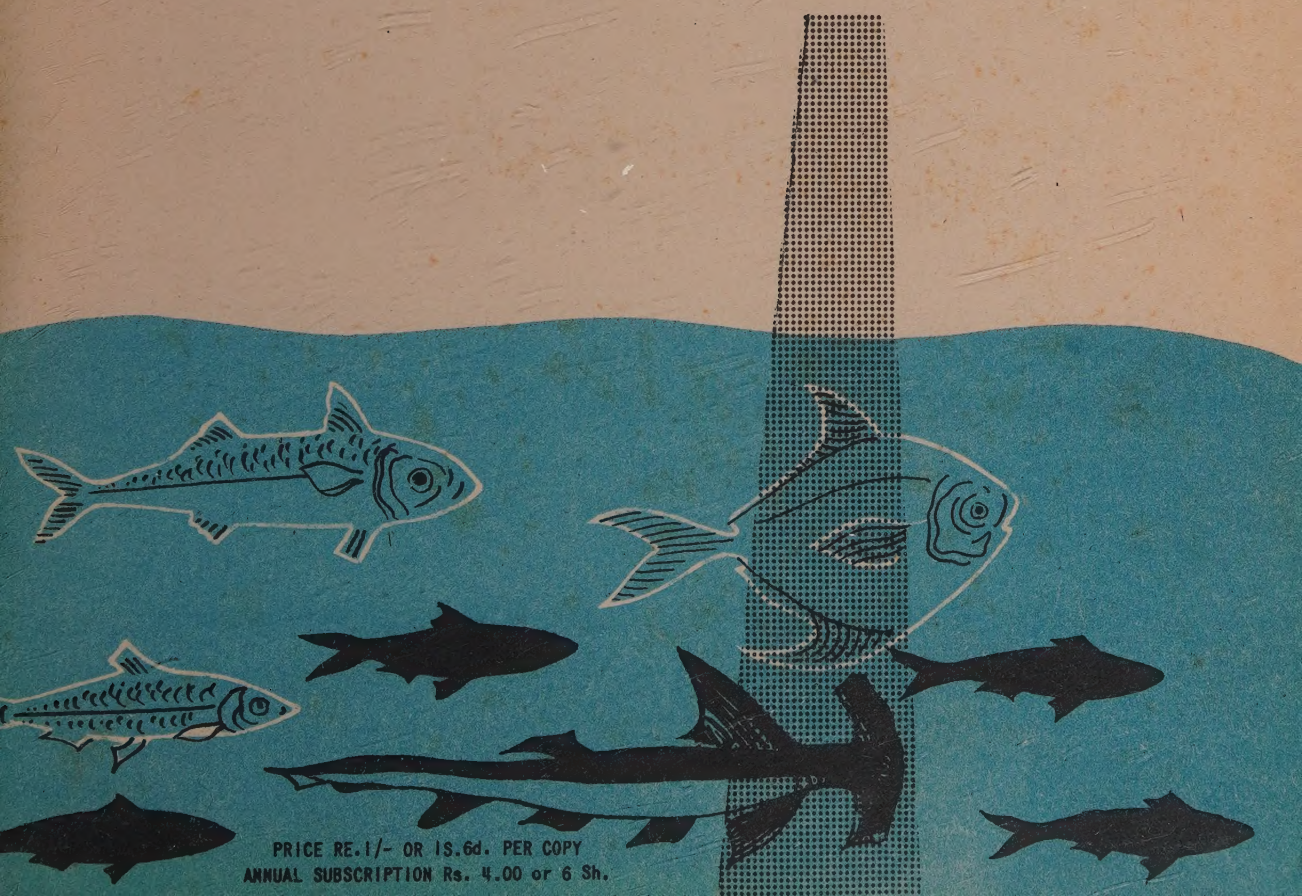
Vol.VII, No.3 July, 1960

7(3)
P.Agr.59.3.60(N)
500

LIBRARY
OCT 15 1962
FISH & WILDLIFE SERVICE



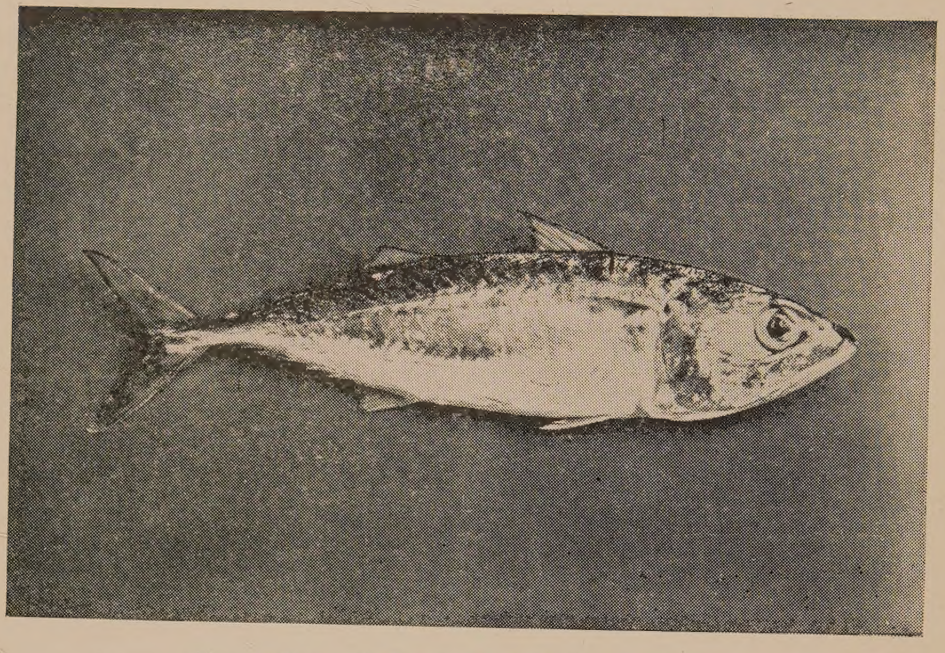
INDIAN FISHERIES BULLETIN



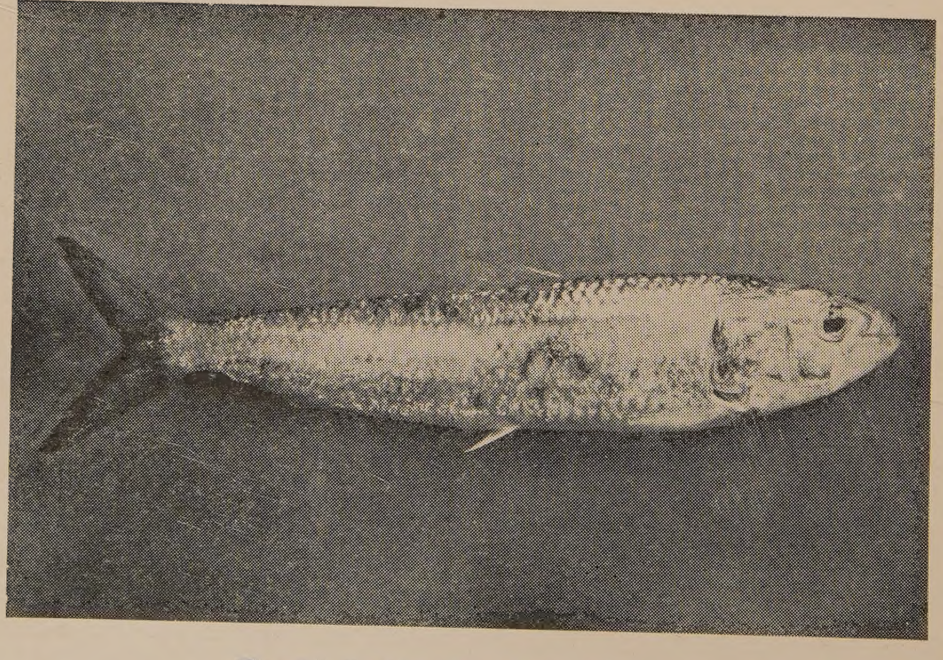
PRICE RE.1/- OR 1S.6d. PER COPY
ANNUAL SUBSCRIPTION Rs. 4.00 or 6 Sh.

CONTENTS

	Pages
A—INDIAN.	
I. GENERAL AND DEVELOPMENT	1
(1) Marine	1
(2) Inland	18
(3) Technology	
(4) Trade	20
(5) Socio-economics	
(6) Conservation & management	
II. FISHERIES DEVELOPMENT IN THE STATES	33
III. MARINE FISHERIES RESEARCH	36
(1) Fishery Biology	36
(2) Hydrobiology	37
IV. INLAND FISHERIES RESEARCH	38
(1) Fishery Biology	
(2) Hydrobiology	
V. FISHERIES TECHNOLOGICAL RESEARCH	39
(1) Fishing Craft	40
(2) Fishing Gear	43
(3) Fish Processing	
VI. FISH PRESERVATION	
(1) Curing	
(2) Pickling	
(3) Salting	
(4) Drying	
(5) Refrigeration	
VII. FISH PRODUCTS.	
(1) Fish meal	
(2) Fish oil	
(3) Fish manure	
B—FOREIGN.	
I. GENERAL AND DEVELOPMENT	45
(1) Marine	45
(2) Inland	
(3) Technology	47
(4) Trade	49
(5) Socio-economics	51
(6) Conservation & Management	51



The Indian mackerel—Rastrilleger canagurta



The Oil Sardine—Sardinella longiceps

INDIAN

GENERAL AND DEVELOPMENT

Marine

(i) Marine Fish landings in India during 1959.

The total Landings of marine fish during 1959 was estimated as 584,193 m. tons as compared to 755,774 m. tons in 1958, showing a decrease of about more than 0·17 million m. tons.

The State-wise break up of the total landings for 1959 and 1958 are as below:—

States	Fish landings in metric tons	
	1959	1958
1. West Bengal & Orissa	3,962	6,267
2. Andhra	29,464	28,846
3. Madras	103,497	118,056
4. Kerala	191,375	294,655
5. Mysore	52,825	80,242
6. Bombay (including Saurashtra & Kutch)	198,192	222,886
7. Andaman & Nicobar	123	82
8. Mechanised Vessels	4,755	4,730
TOTAL	584,193	755,774

The most significant decline in the catches had been in West Bengal and Orissa, Kerala and Mysore. The decline in Madras and Bombay were not significant.

The landings in West Bengal and Orissa are about one third of those of 1958. This was mainly due to the decline in catches of prawns and other crustaceans, other clupeids, Ribbon fish, other Sardines and Pomfrets which showed a high decrease by 76 per cent., 64 per cent., 80 per cent., 60 per cent. and 71 per cent. respectively. Despite the increase in the landings of perches, Mackerel and *Leiognathus,* the overall decrease was not balanced.

The heavy decline in the landings in Kerala was due to the failure of Mackerel and sardine fisheries which accounted for 90 per cent of the net fall in the landings. The landings of oil sardines were nearly half of the last years' catches, while Mackerel landings showed a decline by 56 per cent. The catches of *Anchoviella, Thrissocles* and other clupeids registered an increase during the year, but the total increase was too meagre to compensate the heavy deficiency due to failure of Oil sardine and Mackerel fisheries.

In the State of Mysore, landings of Oil Sardines, and cat fishes were 7 and 3 times the respective landings of 1958. Landings of *Thrissocles, Anchoviella,*

Penaeid prawns and *Leiognathus* showed significant increase but the complete failure of Mackerel lowered the overall landings. Out of the gross decrease of 39,661 m. tons Mackerel alone accounted for 36,003 m. tons during the year.

The Salient features of 1959 fisheries were:—

(a) The Mackerel fishery was very poor during the year and it alone accounted for 31 per cent. of the gross decrease during the year. Barring Bombay which showed some increased landings, the Mackerel landings showed considerable decline in Kerala and Mysore.

(b) Oil sardine fishery also showed a significant decrease which was due to the fall in landings in Kerala, Bombay and Madras State. The fishery accounted for 27 per cent. of the gross decline.

(c) Decrease was witnessed in the landings of Bombay Duck, *Anchoviella*, Sciaenids, perches, *Caranx, Lactarius,* Seer fish and Sole, the percentages of decrease varying between 15 to 46.

(d) The low landings of Ribbon fish accounted for 5 per cent. of the gross fall.

(e) The landings of flying fish were increased by near about 3 times than those of last year. This was due to heavy landings in Madras State.

(f) *Thrissocles* also showed a significant increase which was mainly contributed by Madras, Kerala and Mysore States.

(g) The catches of other clupeids followed by Polynemids showed an increase due to the higher contribution by the states of Madras, Kerala, Bombay and Mysore.

(Central Marine Fisheries Research Station, Mandapam Camp).

(ii) **The composition of Fish Landings in India during 1959.**

Name of Fish	Quantity landed in metric tons	
	1959	1958
1. Elasmobranchs	23,446	24,286
2. Eels	6,076	9,159
3. Cat fishes	20,272	29,872
4. Chirocentrus	5,428	5,549
5. (*a*) Oil Sardine	69,234	123,731
(*b*) Other sardines	41,167	39,958
(*c*) *Hilsa ilisha*	844	991
(*d*) Other Hilsa	3,046	2,660
(*e*) *Anchoviella*	24,477	29,346
(*f*) *Thrissocles*	8,108	3,960
(*g*) Other clupeids	21,211	15,525
6. (*a*) Bombay duck	57,210	67,188
(*b*) Saurida	597	238

Name of Fish	Quantity landed in metric tons	
	1959	1958
7. *Hemirhamphus* & *Belone*	383	348
8. Flying fish	1,668	388
9. Perches	9,389	11,959
10. Red mullets	1,526	2,166
11. Polynemids	7,666	5,974
12. Sciaenids	20,442	25,565
13. Ribbon fish	31,830	41,918
14. (*a*) *Caranx*	9,773	18,133
(*b*) *Chorinemus*	2,658	3,014
(*c*) *Coryphaena* & *Elacate*	471	820
(*d*) *Trachinotus*	2	59
15. (*a*) *Leiognathus*	13,200	12,865
(*b*) Gazza	293	343
16. *Lactarius*	13,842	16,363
17. Pomfrets	17,389	16,587
18. Mackerel	62,198	123,282
19. Seer fish	6,590	7,889
20. Tunnies	2,866	3,239
21. *Sphyraena*	972	830
22. Mullet (*Mugil*)	245	729
23. *Bregmaceros*	3,821	3,884
24. Soles	10,360	12,856
25. (*a*) Penaeid prawns	27,632	29,204
(*b*) Non-penaeid prawns	37,805	55,987
(*c*) Other crustaceans	2,092	1,508
26. Miscellaneous	17,964	7,401
TOTAL	584,193	755,774

(iii) Total effort in man hours and marine fish catch in Kilogram per man-hour in 1959.

The total effort in man-hours expended in each state and the fish catch in Kilogram per hour are as below:—

States	Efforts in 1,000 Man hours		Catch in Kg. per Man-hour	
	1958	1959	1958	1959
1. West Bengal & Orissa	9,733	4,787	0·64	0·83
2. Andhra	50,628	47,436	0·57	0·62
3. Madras	66,149	69,166	1·78	1·50
4. Kerala	95,391	63,328	3·09	3·02
5. Mysore	10,809	10,271	7·42	5·14
6. Bombay (including Saurashtra & Kutch) .	80,543	52,391	2·77	3·78
Total .	313,253	247,379	2·40	2·34

The total effort as well as the catch per unit of effort during the period 1959 were less than those of 1958. Barring Madras, all States put less effort during the year than the last year. An increase of catch per unit of effort was witnessed in respect of West Bengal and Orissa, Andhra and Bombay while the others showed a decline.

(Central Marine Fisheries Research Station, Mandapam).

(iv) Mackerel fishery on the west coast during the year , 1959-60

The Indian mackerel fishery was very poor all along the west coast during the year 1959-60. At Karwar the total annual catch was 971·11 m. tons as against 2,744·2 m. tons in 1958-59; the fishery commenced here on 23-10-1959 with the first Rampan operation and lasted till the end of February; there were 71 fishing days during which 140 hauls were made. The maximum monthly total catch was in December with 386·74 m. tons in 53 hauls for 20 fishing days, while the lowest catch was in February with 2·81 m. tons in 9 hauls for 8 days.

At Mangalore (Ullal) the total annual catch amounted only to about 21·6 m. tons, of this 5 m. tons were landed in April and May. There was no fishing during the monsoon and the new season started in September. But the total catch for both September and October was only about 13 m. tons at Ullal. The fishery declined further after October. In addition to the sea fishery there was also a Mackerel fishery of a minor magnitude in the Netravati estuary in May 1959 and from December 1959 to March 1960.

At Calicut the year's total was 471·13 m. tons forming 13·5 per cent. of the total landings and only about one third of the previous year's catch. The Mackerel fishery during October and November 1959 was, however, better than in the corresponding months of the years 1957 and 1958.

At Ernakulam the Mackerel fishery was reported to be of a very moderate magnitude during the year. At Vizhingam the total annual landings of Mackerel amounted to 66,223 kg. of which 8,897 kg., 51,012 kg., 5,152 kg., and 1,162 kg. were recorded in the first, second, third and fourth quarters respectively.

The shore-seine, *Rampan* was the chief net used for the Mackerel fishery at Karwar. At Ullal (Mangalore) the *Pattavala* and the *Kanthavala* accounted for about 97 per cent. of the total annual catch; of these two nets, the *Pattavalla* was the more important both in regard to total landings and catch per unit of effort; about 90 per cent. of the annual *Pattavala* catch was landed in September and October. At Calicut, the boat-seines, *Ailakollivala* and *Pattenkollivala* and the gill-net, *Ailachalavala* were the main nets used for Mackerel fishing. The main gears used at Cochin were the *Thanguvala* (boat-seine) *Ailavala* (gill net) and the purse-seine. In the neighbourhood of vozhingom again, shore-seines, boat seines and drift nets were the gear in operation.

(Central Marine Fisheries Research Station, Mandapam).

(v) **The Oil sardine fishery on the West coast during 1959-60.**

At Karwar the Oil Sardine fishery was the best in four years, the total landings being 141·789 m. tons as against 90·706 m. tons in 1958-59. About 99 per cent. of this catch was obtained in the *Rampan* net, but some catches were obtained in the *yendi* and the cast net also. The fishery was very poor at Mangalore (Ullal) with a total catch of 55.84 m. tons for the whole year, of this 55.7 m. tons were landed in November alone and all this quantity was caught by the cast net and gill net. The fishery was poor at Calicut also, the total landings being 1,561.15 m. tons as against 4,062.58 m. tons in 1958-59; more than 85 per cent. of the landings were obtained from August to January, the highest catch (539.7 m. tons) being obtained in October. Among the different gears used for oil sardine at Calicut the *Kollivala* (*Pattenkolli* and *Mathikolli*) and *Thattum* vala accounted for 72.8 per cent. and 25.11 per cent. of the total Oil sardine landings with 72.8 per cent. and 22.93 per cent. of the total effort respectively.

(Central Marine Fisheries Research Station, Mandapam).

(vi) **Prawn Fisheries of the west coast during the quarter ending December 1959.**

In the Cutch area the prawn fishery is reported to have been poor in the IVth quarter. In the first half catches consisted mostly of *Metapenaeus monoceros* followed by *Leander sp.* and *M. brevicornis.* Except a few males the entire catch of *M. monoceros* was made up of juveniles and immature prawns. The magnitude of the prawn catches fell markedly in the last month of the quarter. The prawn fishery in the Bombay Zone was quite good during the quarter, the chief constituents being *M. affinis, Hippolysmata ensirostris* and *Parapenaeopsis sculptilis.* In October and November the catches are reported to have been remarkably heavy near Bombay City, the prawn landings in the first two weeks of October forming about 60 per cent. of total at Versova and Sassoon Docks. In December there was a marked fall, the proportion of prawns came down to about 15 per cent. all along the coast.

The quarter also seems to be the active breeding period of most of these prawns since a large proportion of the females had almost fully ripe ovaries or were berried.

The prawn fishery in and around Mangalore was generally poor. The catches comprised for the most part of *M. dobsoni* and *Penaeus indicus.* In the trawl net catches the former was dominant in October but in December M. *affinis* and *P. stylifera* were the chief species caught.

In the Malabar area also the fishery was poor. In November there was practically no prawn landings and those of the other two months were comprised entirely of *M. dobsoni* and *P. indicus* in the proportion of 64:36. In the middle sector of Kerala the fishery was no better than in the northern sector. Three species *viz., M. dobsoni, M. affinis* and *P. stylifera* were the most important constituents at all the centres, *P. stylifera* dominating in the first half and *M. dobsoni* replacing it in the second half of the quarter. The larger length groups of M. *dobsoni* that were so common in previous months became scarce or even absent and smaller groups had entered the fishery.

In the trawl net catches of the Government of India and Indo-Norwegian Project vessels, mostly operating in inshore waters *M. monoceros, M. dobsoni, M. affinis* and *P. indicus* were the more common species, *M. dobsoni* ranking first in abundance in December. Unlike the back-water catches of *M. monoceros* individuals measuring over 120 mm. were quite common. Large sized prawns of *P. indicus* measuring over 150 mm. were also present in fairly good numbers in December. Prawns of similar size and belonging to the same species were caught by M. T. *'Pratap'* in considerable numbers off Quilon and Kayamkulam in 17-22 fathoms in December. Their capture points to their probable occurrence in Deeper waters and to the need for undertaking exploratory shrimp fishery in offshore areas for ascertaining their distribution and for discovering if large concentrations exist.

The fishery of *Palaemon carcinus,* the fresh water prawn that descends into brackish water during this period was most active at 2 centres near Kottayam.

(Central Marine Fisheries Research Station, Mandapam).

(vii) Offshore work at Cochin

The exploratory offshore fishing activities revived after the monsoon break early in September. M. T. 'Pratap' was reconverted into an otter trawler and made six voyages spending 217 hours on actual fishing and landed a total quantity of 32,803·6 kg. of fish, chiefly comprising of fishes like *Nemipterus japonicus, Lactarius lactarius,* Sciaenids clupeids etc. The average yield worked out to 59.8 kg., 252.4 kg. and 167.5 kg. per trawling hour respectively in September, October and November. The fishing was confined to the areas 108, 110 and 111 lying off Cochin and Quilon.

M.F.V. *'Samudra'* and *'Tarpon'* of the Offshore Fishing Station, were engaged in the bull-trawling operations for about four weeks in September-October and landed a total catch of 4,478 kg. at an average rate of 116.8 kg. per hour from areas near about Cochin. Thereafter all the three vessels operated shrimp trawl nets in 106, 108 and 110 areas and by the end of November the total catch amounted to 85,803 kg. average being 233.16 kg. per trawling hour. Dominant species of the catch was *N. japonicus,* in the

first half and *Lactarius lactarius* in the later half. Prawns formed a significant portion of the catch only in November.

Four vessels of the Indo-Norwegian Project fishing in the same fishing grounds using shrimp trawl nets during September to November caught 45,041·6 kg. of fish spending 29·25 hours in actual trawling with an average yield of 154·65 kg. per hour. The composition of the catch was similar to what was observed in the Government of India vessels. The Medium boat M-I was operating a purse seine from September onwards for 23 days had a total catch of 12,570 kg. of fish comprising of Sardines and Mackerel.

(Central Marine Fisheries Research Station, Mandapam)

(viii) **Off-shore Dara Fisheries of Saurashtra-Bombay Region**

Preliminary analysis of Bull trawlers landings for the past three years point to heavy concentrations of juvenile and immature Dara around the Dwarka area gradually decreasing in concentration around the 20-fathoms line towards south-east as we proceed towards Bombay. The time sequence of their occurrence in different area indicates the possible migration southwards towards the gulf of Cambay and westwards towards Jamnagar from the Dwarka area, unless the adults occurring around Jamnagar, Dhanu and Satpati in inshore waters belong to different populations. Studies are in progress to elucidate this problem.

(Central Marine Fisheries Research Station, Mandapam)

(ix) **The Government of India quick freezing and cold Storage Plant at Bombay**

During the period from January, 1960 to June, 1960 the income realised from (1) sale of ice (2) Basket Storage of fresh fish (3) Freezing charges of fresh fish and (4) Frozen fish storage rental are as follows:—

Activity	Value realised
	Rs. nP.
(1) Sale of ice (1512 tons 15 Cwt. 5 lbs)	50,296·62
(2) Basket Storage of fresh fish	17,805·09
(3) Freezing charges of fresh fish.	9,456·00
(4) Frozen fish storage rental	27,455·60
	[1,05,013·31

(x) Government of India's Deep Sea Fishing Station Bombay, Cochin, Tuticorin and Visakhapatnam

During the period from January, 1960 to June, 1960 the exploratory fishing operations of the Government of India Deep Sea Fishing Stations are as follows:—

Name of the Vessel	No. of days absent from the port	Qty. of fish caught.			Catch/days absence			Value realised
		Tons.	Cwt.	Lbs.	Tons.	Cwt.	Lbs.	Rs. nP.
Tuticorin								
Sardinella	127	4	13	6·5	0	0	82	2,567·46
Sagar Sundari	20	0	5	110	0	0	33·5	165·86
Meenakshi	50	0	17	74	0	0	39·6	401·76
Meenalochani	21	3	16	54·5	0	3	72	1,285·15
Visakhapatnam								
M.T. Ashok	52	43	9	105	0	16	82	10,787·50
M.V. Sea Horse	35	3	14	7	0	2	12	298·00*
M.V. Sagar Kumari	78	4	7	104	0	1	14	1,612·50
M.V. Gudjon	7	0	0	44	0	0	6	11·00
Dan No. 1	48	2	17	31	0	1	21	1,456·75
Dan No. 2	34	2	1	108	0	1	26	1,126·50
Bombay (upto April 1960)								
M.F.V. Bangada	10	4	5	5	0	8	56	669·86
M.F.V. Jheenga	66	84	14	0	1	5	74	21,484·50
M. L. Sagar Pravasi	77	13	16	81	0	3	37	3,390·75
M. L. Meera	71	19	16	60	0	5	66	2,642·84
M.L. Sagar Kanti	9	1	4	44	0	2	80	615·18
M.F.V. Bumili	87	39	13	75	0	9	14	10,792·50
M.F.V. Champa	37	13	3	109	0	7	15	3,546·00
M.L. Sagar Vihari	No fishing due to repairs.							
Cochin (For January and February only)								
M. T. Pratap	24	59	4	8	2	9	38	13,690·20
M. L. Durga	39	57	2	93	1	9	34	18,986·50
M. V. Samudra	38	38	19	58	1	0	57	15,282·28
M. V. Tarpon	40	46	3	58	1	3	10	17,034·08

*The value realised during February and March 1960 has not been included.

(xi) **The landings of four bull trawlers of New India Fisheries Ltd., Bombay, for the half year ending June, 1960**

Name of the Vessel	Period of Voyage	No. of days absent from port.	Qty. caught (tons)	Catch/Day's absence. (tons)	Depth fished (metres)
Arnala & Paj	27-12-59 to 6-1-60	11	66	6·0	38—42
	7-1-60 to 19-1-60	13	80	6·1	38—44
	20-1-60 to 31-1-60	12	81	6·7	33—44
	1-2-60 to 11-2-60	11	77	7·0	34—45
	15-2-60 to 23-2-60	9	82	9·1	35—41
	24-2-60 to 5-3-60	11	77	7·0	35—43
	6-3-60 to 16-3-60	11	80	7·2	32—38
	17-3-60 to 27-3-60	11	63	5·7	36—42
	28-3-60 to 7-4-60	11	61	5·5	25—52
	9-4-60 to 19-4-60	11	76	6·9	32—39
	21-4-60 to 1-5-60	11	68	6·1	32—52
	8-5-60 to 17-5-60	10	53	5·3	34—70
	19-5-60 to 29-5-60	11	76	6·9	40—49
	31-5-60 to 9-6-60	10	65	6·5	37—63
	11-6-60 to 20-6-60	10	66	6·6	42—48
	22-6-60 to 30-6-60	9	68	7·5	22—51

Name of the Vessel	Period of Voyage	No of days absent from port	Qty caught (tons)	Catch/days absence (tons)	Depth fished (metres)
'Satpati' & 'Pilotan'	4-1-60 to 14-1-60	11	84	7·6	28—38
	15-1-60 to 25-1-60	11	68	6·1	32—39
	26-1-60 to 5-2-60	11	77	7·0	33—42
	6-2-60 to 16-2-60	11	84	7·6	33—41
	17-2-60 to 28-2-60	12	81	6·7	32—39
	29-2-60 to 10-3-60	11	76	6·9	35—38
	11-3-60 to 20-3-60	10	82	8·2	35—39
	21-3-60 to 1-4-60	12	83	6·9	29—42
	7-4-60 to 16-4-60	10	75	7·5	34—35
	17-4-60 to 27-4-60	11	72	6·5	29—38
	29-4-60 to 9-5-60	11	86	7·8	31—65
	11-5-60 to 22-5-60	12	68	5·6	32—47
	24-5-60 to 3-6-60	11	78	7·0	36—45
	5-6-60 to 14-6-60	11	65	5·9	36—60
	16-6-60 to 25-6-60	10	78	7·8	39—50

(xii) **Comparative statement showing the merits of fishing gear and fish catch during the month of January in the years 1959 and 1960**

Sl. No.	Name of Vessel	Fishing gear				Fish catch			
		January 1959		January 1960		January 1959		January 1960	
		Otter Board	Net	Otter Board	Net	Catch	Value	Catch	Value
		lbs.	ft.	lbs.	ft.	lbs.	Rs. NP.	lbs.	Rs. NP.
1	M. L. Durga	135	60	150	60	27,975	7,857·42	49,838	8,662·07
2	M. V. Tarpon	110	53	150	56	26,289	5,117·19	45,230	8,781·49
3	M. V. Samudra	85	50	135	56	17,281	3,361·48	37,303	6,327·01
						71,545	16,336·09	126,371	23,770·57

(Mr. Nakai, Colombo Plan Shrimp Trawl Expert, Cochin 1-2-60).

(xiii) The quarterly review of Indo-Norwegian Project for the months January—March 1960

Fishing:

Purse-seining operations were conducted by 'M-I' for few days in January: Otter-trawling off Cochin was continued throughout the period by "M-1" to "M-4" and "Ashtamudi". R/V "Kalava" performed three trawling and two handline fishing trips with good catches. Experimental Tuna Fishing was conducted near Laccadive Islands.

The total landings at Cochin by INP boats and trawlers was 2,17,632 kgs. of fish and prawns valued at Rs. 49,563·57. This includes 70,728 kgs. of prawns and 1,46,904 kgs. of fish. The average catch per fishing day was 517 kgs., per hour was 132 kgs. and per haul was 151 kgs.

The landings by INP vessels at Quilon was 72,851 kgs. of which 67,581 kgs. were sold for Rs. 31,024:93. The training vessels caught 158 kgs. of fish valued at Rs. 69·31. At Quilon the average catch per fishing day was 743 kgs. per hour was 151 kgs. and per haul was 209 kgs.

At Sakthikulangara and Puthenthura 22′ mechanised boats caught 78,661 kgs. of fish worth Rs. 31,875·53 and 25′ mechanised boats caught 27,040 kgs. of fish valued at Rs. 12,667·71.

Maintenance, overhauling, Boat Building :

Nine 25′ INP boats were almost completed and engine installations are progressing. The first 23½′ ovald boat was got ready and construction of other two boats started. Four 36′ "M" boats are expected to be completed within six months.

"M-6", M/V "Flying-Fish", R/V "Conch", INP-2, INP-4 and "ovald-1" underwent minor repairs at the Boat Yard and Workshop. M/V "Ashtamudi" was cleaned and painted and a new silencer was fitted and the engine of R/V "Conch" was repaired at Brunton's Workshop.

The body of insulated fish van No. 3 was completed, of Van No. 1 the silencer was repaired and on No. 5 exhaust pipe and the fuel tank were also repaired at the INP Boat Yard and Workshop.

Overhauling of electronic and electrical equipment were carried out on R/V "Conch", M/V "Bangada", M/V "Gudjon", R/V "Kalava", M/V "Ashtamudi" M/V "Flying Fish" and 4 medium boats and necessary equipment changed.

Repair of trawl nets in "M-6" and "Flying Fish" was carried out. Five new prawn trawls and ten new prawn trawl bags have been made. Other prawn trawls, tuna purse seine and floating trawls were repaired.

Refrigeration:

During the quarter 67,502 kgs. of fish and 5,581 kgs. of prawns were received at Refrigeration plant out of which 62,444 kgs. fish and 5,369 kgs. of prawns were issued for marketing. 7,77,175 kgs. of ice was produced and 7,42,250 kgs. sold.

Marketing:

The marketing of fresh fish was conducted in the hilly regions of Central Travancore by the Marketing Section at Quilon. In all 67,813 kgs. of fish was sold for Rs. 31,119·24. The average price per ton amounted to Rs. 458·90. The sale in the month of March was remarkable and the sale proceeds reached to Rs. 16,040.47. At Cochin 2,20,912 kgs. of fish was sold to contractor for Rs. 50,168·19. Several other new markets were visited to study their general condition and demand with successful results.

Training:

Training of 9th batch completed on 29th February. 25′ INP boats were issued to 5 of these trainees. Beach landing trials were carried out at Puri.

Research:

R/V 'Kalava' undertook 3 research cruises between Alleppy and Quilon, Cochin and Ponnani. Hydrological observations, BT recording and sampling of dissolved oxygen were made at a number of Stations. R/V "Conch" was operated from Cochin to Trivandrum collecting bottom samples and temperature data. Trails with beam trawl was also conducted.

Health:

Clinical work continued as usual at maternity ward, preventine clinics, curative clinics and tuberculosis clinics. 1,552 persons have been tubercluin tested and 859 vaccinated against tuberculosis. 187 School children and the staff and workers of the Project were examined. The work on environmental sanitation, family planning, nutrition classes, epidemic diseases and social work progressed well.

Construction works:

For the construction of the INP Fishery Station at Ernakulam a new site of 3 acres of land on the foreshore reclamation area at Ernakulam was allotted and the site was taken charge of in February 1960. Preliminary work and investigation of the site and soil and planning of the Fishery Station is in progress.

The Chief Medical Officer Dr. Odd Sverre left for Norway on the expiry of his assignment and was replaced by Dr. Johs Solem. The Boat builder, Mr. Ovald Bratholmen who had been working in the Project almost since its inception, left for good to Norway. A shipbuilding Engineer, Mr. Edvin Stenodogaard, Mr. Olo Haaland, Assistant to the Fisheries Leader and Mr. Helge Eide joined duty at the Project during the quarter.

Expenditure:

The Norwegian expenditure in India and in Norway was Rs. 3,13,800 and Rs. 4,12,500 respectively which brought the total expenditure to Rs. 2,19,28,700.00 while the Indian expenditure was Rs. 2,28,772.00 bringing the total expenditure to Rs. 22,04,433.00.

The revenue realised and remitted during the quarter was Rs. 1,09,509.00 and total during the financial year from 1st April, 1959 to 31st March, 1960 was Rs. 2,66,527.00.

(xiv) Marine Fish landings in the States of Andhra and Madras

(Figures in metric tons.)

Sl. No.	Name of fish	ANDHRA		MADRAS	
		1957	1958	1957	1958
1.	(*a*) Sharks	1712·51	1951·59	2908·60	2953·28
	(*b*) Skates	314·32	450·40	501·00	1157·32
	(*c*) Rays	165·81	328·69	2014·57	2359·29
	(*d*) Non-classified Elasmobranchs	8·33	..	..	..
2.	Eels	52·86	28·20	85·56	12·65
3.	Cat fishes :				
	(*a*) *Arius* spp.	1181·79	1136·24	3527·40	4770·23
	(*b*) Other cat fishes	0·72	..	9·93	2·03
4.	*Chirocentrus dorab*	403·80	676·98	3116·6	2541·74
5.	(*a*) Oil Sardine : *Sardinella longiceps*	0·02	0·05	384·39	145·74
	(*b*) Other sardines :—				
	Sardinella albella	..	..	71·70	217·77
	S. fimbriata	2153·87	600·79	466·71	621·36
	S. gibbosa	..	1·25	890·16	755·24
	S. sirm	..	..	1206·24	603·95
	Non-classified *Sardinella* spp.	773·73	1372·28	339·24	550·66
	Dussumieria spp.	271·12	598·80	2286·72	5009·91
	Kowala coval	57·93	318·62	..	..
	(*c*) *Hilsa ilisha*	394·11	106·81	5·95	53·35
	(*d*) Other Hilsa spp.	283·27	845·58	38·66	33·94
	(*e*) Whitebaits : *Anchoviella* spp.	6944·84	3703·04	3100·97	19054·09
	(*f*) Anchovies : *Thrissocles* spp.	812·39	721·14	1517·55	852·73
	(*g*) Other clupeids :				
	Ilisha spp.	1422·90	1236·80	1290·34	981·1
	Coilia spp.	199·52	65·50	91·66	222·48
	Anadontostoma chacunda	246·31	193·84	16·28	339·57
	Nematalosa nasus	2·87	13·11	117·70	255·49
	Ophisthoterus tardoore	111·29	86·82	103·45	205·69
	Setipinna spp.	49·48	21·21	4·49	5·70
	Non-classified clupeids	277·37	137·55	131·41	55·65
6.	(*a*) Bombay duck : *Harpodon nehereus*	399·24	325·95	..	2·07
	(*b*) (*i*) *Saurida* spp.	62·67	113·87	134·71	100·76
	(*ii*) *Saurus* spp.	..	..	5·19	11·47

Sl. No.	Name of fish	ANDHRA		MADRAS	
		1957	1958	1957	1958
7.	(*a*) (*i*) *Hemirhamphus* spp.	7·53	50·83	55·86	89·56
	(*ii*) *Tylosurus* spp.	2·32	3·74	12·60	43·68
	(*b*) Flying fish : *Cypsilurus* spp.	5·33	35·35	915·71	336·00
8.	Perches :				
	Lutjanus spp.	62·41	65·17	348·86	624·10
	Lates calcarifer	16·66	18·24	17·51	18·31
	Pomadasys spp.	59·53	128·52	217·63	261·06
	Nemipterus spp.	3·16	3·17	226·59	326·81
	Epinephelus spp.	142·27	55·20	749·59	1187·53
	Therapon spp.	21·52	18·74	194·98	268·98
	Scolopsis spp.	..	..	22·79	6·03
	Lethrinus spp.	..	6·34	529·89	819·01
	Teuthis spp.	..	..	54·83	51·43
	Sparus spp.	..	..	0·04	7·73
	Ambassis spp.	19·53	45·52	..	..
	Sillago spp.	107·37	17·70	334·16	377·30
	Gerres spp.	655·63	77·75	171·19	215·54
	Pristipomoides	..	..	88·92	1·82
	Diagramma spp.	7·54	0·49	8·71	205·83
	Non-classified perches	34·55	59·56	143·09	214·81
9.	Red mullets :—				
	Upeneus spp.	17·59	117·43	1·67	111·95
	Upeneoides spp.	903·63	138·06	1371·16	716·22
10.	Thread fins : *Polynemus* spp.	150·91	145·17	285·34	543·79
11.	Jew fishes :				
	Sciaena spp.	2496·18	2225·70	2001·13	2799·12
	Otolithus spp.	780·92	114·93	1571·72	1627·19
	Sciaenids	27·17	126·20	1379·40	568·86
12.	Ribbonfishes : *Trichiurus* spp.	2909·24	1309·96	11351·47	24545·19
13.	(*a*) *Caranx* spp.	475·80	656·15	5312·39	9118·97
	(*b*) *Chorinemus* spp.	102·07	189·84	1388·30	706·38
	(*c*) *Trachinotus* spp.	4·70	..	0·27	58·84
	(*d*) *Coryphaena hippurus*	2·16	13·26	64·11	147·32
	(*e*) *Rachycentron canadus*	14·80	19·86	88·55	82·68
	(*f*) Other carangids	..	..	..	14·02
14.	Silver bellies :				
	Leiognathus spp.	5347·04	728·37	4470·31	5116·14
	Gazza minuta	630·58	179·98	244·57	145·43

Sl. No.	Name of fish	ANDHRA		MADRAS	
		1957	1958	1957	1958
15.	*Lactarius lactarius*	469·38	459·90	3450·68	12241·28
16.	(*a*) Black pomfret : *Parastromateus niger*	..	236·90	..	466·67
	(*b*) *Pampus* spp.	..	..	..	444·99
	(*c*) Nonclassified pomfrets	1546·17	1555·29	1785·01	632·49
17.	(*a*) Mackerel : *Rastrelliger canagurta*	1005·10	293·17	1397·25	392·68
	(*b*) Seer fish : *Scomberomorus* spp.	1107·08	944·02	3753·96	3512·65
	(*c*) Tunnies : *Thynnus spp.*	17·38	22·90	1500·71	776·78
18.	Sea-pike : *Sphyraena* spp.	15·48	8·29	272·45	399·30
19.	(*a*) Mullets : *Mugil* spp.	16·99	29·92	54·15	44·70
	(*b*) *Atherina* spp.	..	..	8·29	0·02
20.	Soles or flat fishes :				
	(*a*) *Cynoglossus* spp.	150·41	66·29	130·96	78·12
	(*b*) *Plagusia spp.*	6·36	3·64	..	..
	(*c*) *Pseudorhombus spp.*	55·83	0·56	17·33	36·49
	(*d*) *Psettodes erumei*	0·23	2·49	7·56	3·96
	(*e*) Nonclassified soles	..	..	..	0·29
21.	(*a*) Penaeid prawns : *Penaeus* spp.	..	805·88	..	996·16
	Parapenaeopsis spp.	..	3·10	..	..
	Metapenaeus spp.	..	707·03	..	31·53
	(*b*) Non-penaeid prawns :				
	Leander spp.	..	292·76	..	..
	Carid Prawns	..	..	..	..
	Non-classified prawns & Shrimps	1056·71	346·03	1551·06	772·72
	(*c*) *Acetes* spp.	867·69	167·04	323·95	123·57
	(*d*) Other crustaceans :				
	(*i*) Crabs	252·63	126·55	53·74	4·13
	Neptunus spp.	..	730·91	166·09	360·31
	Scylla serrat	..	16·71	1·76	4·41
	(*ii*) Lobsters	..	..	..	0·04
	Palinurus spp.	..	..	16·68	179.18
	Miscellaneous.	583·90	439·76	2613·33	1221·12
	TOTAL	40462·55	28845·48	79294·50	118056·48

(xv) Landings of Shrimp in Andhra Coast

(Figures in metric tons).

Sl. No.	Year	Months												Total
		Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	
1	1959	60·98	48·39	74·33	185·41	114·62	105·27	196·19	314·88	1044·29	117·36	357·24	85·46	2704·42
2	1958	160·05	80·27	38·14	43·86	169·16	171·11	391·76	533·98	376·16	57·93	64·58	234·83	2321·83
3	1957	148·79	11·80	238·70	69·96	137·13	98·40	179·25	204·52	171·18	180·58	284·03	200·05	1924·39
4	Total	369·82	140·46	351·17	299·23	420·91	374·78	767·20	1053·38	1591·63	355·87	705·85	520·34	6950·64
5	Average	123·28	46·82	117·06	99·74	140·30	124·93	255·73	351·13	530·54	118·62	235·28	173·45	2316·88

Landings of Shrimp in Madras Coast

(Figures in metric tons).

Sl. No.	Year	Months												Total
		Jan.	Feb.	March	Apr.	May	June	July.	Aug.	Sept.	Oct.	Nov.	Dec.	
1	1959	134·16	488·66	132·59	52·92	32·08	165·61	209·08	193·37	133·30	76·21	63·05	137·15	1818·18
2	1958	228·72	434·67	101·12	24·21	27·47	133·09	227·03	83·64	176·77	30·00	190·85	265·83	1923·40
3	1957	122·62	45·55	53·38	51·58	43·51	136·36	278·70	239·27	133·43	111·42	250·54	403·07	1879·13
4	Total	485·50	968·88	287·09	128·71	103·06	435·06	714·51	516·28	443·50	217·63	514·44	806·05	5620·71
5	Average	161·84	322·96	95·70	42·90	34·35	145·02	238·17	172·09	147·84	72·54	171·48	268·68	1873·57

Inland

Fish Seed supply for cultural purposes from Calcutta

During 1959-60 the total quantities of advanced fry and spawn supplied to the different States and to foreign countries were over 2·5 crores and 1 crore respectively.

State-wise break ups are :—

	Fry	Spawn
1. Mysore	22,00,000	Nil
2. Bombay	59,00,000	Nil
3. Madhya Pradesh	80,00,000	65,00,000
4. Tripura	15,00,000	35,00,000
5. Manipur	2,00,000	Nil
6. Assam	15,00,000	Nil
7. Madras	50,000	Nil
8. Kerala	50,000	Nil
9. Pondicherry	50,000	Nil
10. Andhra Pradesh	20,000	Nil
11. Private parties	5,60,000	Nil
	2,50,20,000	1,00,00,000
	(plus 10% for mortality allowances)	
Abroad—Penang	6,400	(pure Catla fingerling).
Colombo	2,000	(free supply)

During last year about 95 lakhs of fry and 45 lakhs of spawn were sent in rail. The size of the fry supplied varied from $\frac{1}{4}$" to $1\frac{1}{4}$" and that of fingerlings $1\frac{1}{2}$" to $2\frac{1}{2}$" in length.

The price of fish seed during 1959-60 were as follows :

The price includes netting, handling, conditioning, labour charges for packing, delivery at 47/1 strand road, Calcutta.

1. Fry in open container	Rs. 8·00 per 11,00 including 10% mortality.
2. Fry in oxygen packed container	Rs. 10·00 per 11,00 including 10% mortality.
3. Fingerlings	Rs. 12·00 per 11,00 including 10% mortality.

Price of containers and transport charges from 47/1 strand road to booking office are charged extra.

(Fisheries Extension Unit, Calcutta)

(ii) Tagging Experiments

Extensive tagging experiments were carried out on Hilsa, a commercially important fish of the area, in the Hoogly, the Padma and the Ganga rivers. Similarly over 6000 fish were tagged in the Chilka lake. The tagging experiments will provide information on the migratory trend of fishes and also their rate of growth and other factors required for proper management of their fisheries.

(Central Inland Fisheries Research Station, Barrackpore)

(iii) Fish Breeding Experiments

Large scale experiments were conducted at the Pond Culture Sub-station at Cuttack to breed the common carp on a commercial scale and to produce large number of fish fry. During the quarter ending March, 1960, over 50 lakhs of fish fry were produced and made available to the Orissa Fisheries Department for rearing them in their selected fish farms in the State. A modest estimate of the cost of the fish fry produced would be approximately Rs. 20,000/-. This fish which has been newly introduced into India has proved to be a very valuable food fish which can be cultured all over the country. Efforts are being made to distribute this fish to all parts of India.

Mirror carp, another important food fish which was not known to breed in lower elevations has been induced to breed naturally by certain techniques at very low altitude at Cuttack. The breeding of this fish was successfully carried out at the Pond Culture Sub-Station.

Experiments on the rearing of two important Chinese food fishes, the Silver Carp and the Grass Carp which were recently obtained from Japan and Hongkong were continued at Cuttack.

In addition to large scale breeding of the common carp *Cyprinus carpio* on a commercial scale, fish breeding experiments on the Major Carps of India were conducted in Assam Pond Culture Unit and Cuttack Sub-station. Large number of Major Carps have been induced to breed by pituitary hormone injections. This item of work has a great importance in regard to adequate supply of quality fish seed for cultural operations.

(Central Inland Fisheries Research Station, Barrackpore)

(iv) Deep Water Fishing Experiments

Most of the large reservoirs in India are not adequately exploited for fisheries since at present fishing in Deep Water reservoirs is not known in India. In order to exploit the fisheries of the reservoirs, experiments on deep water fishing were initiated with the help of Mr. S. B. Gulbadamov, a Russian Gear Technologist who has been assigned to C.I.F.R.S. under the F.A.O. Technical Assistance programme.

Deep water fishing experiments were effectively conducted in the Mettur reservoir in the Madras State by Mr. S. B. Gulbadamov, with the collaboration of the Lacustrine Unit of this Research Station. The experiments yielded very valuable results. The average catches by the newly designed nets are about 4-5 times more than the nets used by the local fishermen. The light fishing conducted has indicated the preference of yellow light for congregation of fishes and plankton. The red light proved to be negative. The other

coloured lights were not as efficient as the yellow light from the point of view of fishing operation. An echosounder survey has proved that it is possible by such a survey to select suitable fishing grounds in the deep water reservoirs. These experiments are proposed to be carried out on a wide scale all over India which will ultimately result in the full exploitation of the reservoir fisheries all over India.

(Central Inland Fisheries Research Station, Barrackpore)

Trade

(i) Exports for the year ending 31st December, 1959

Articles and Countries to which exported	Twelve months ended December, 1959. Quantity (cwt.)	Value (Rs.)
031 Fish Fresh or simple Preserved		
031 oI Fish Fresh chilled or frozen		
Hilsa live or dead		
Bharein Is	2	270
Kuwait	18	2,040
Ceylon	2	150
Singapore	302	23,450
Kenya	4	462
	328	26,372
Fresh Fish live or dead		
Others		
U. K.	28	3,903
Netherlands	1	322
Switzerland	..	26
Greece	..	20
Bahrein Is	58	8,224
Kuwait	90	11,988
Trcl Oman	3	333
Singapore	240	13,727
Saudi Arab	26	3,084
Nepal	2	585
U.S.A.	29	5,441
Australia	..	50
Germany W	3	1,169
	480	48,872
Bangdas wet salted		
Ceylon	23,740	2,96,760
	23,740	2,96,760

Articles and Countries to which exported	Twelve months ended December 1959	
	Quantity (cwt)	Value (Rs.)
Soormai Wet salted		
Ceylon	3,410	1,55,715
	3,410	1,55,715
Other Fish wet salted		
Kuwait	51	4,112
Ceylon	3,220	1,12,952
Nepal	1	125
	3,272	1,17,189
		6,44,908
031 02 Fish salted dried or smoked But not further prepared		
Bomlas dry unsalted		
U. K.	74	19,328
Switzerland	1	570
Kuwait	5	484
Ceylon	1,62,334	1,30,69,619
Singapore	696	51,724
Malaya	11	808
Saudi Arab	19	5,705
Burma	2,146	1,69,126
Rhodesia S.	20	2,260
Zanzibar	12	1,015
Kenya	35	2,364
Uganda	5	583
Tanganyika	11	947
Mauritius	4,126	3,03,518
U.S.A.	21	1,830
Fiji Is	15	1,929
Fish dried unsalted		
Other sorts		
France	1	396
Aden	3	553
Ceylon	6,832	6,17,346
Singapore	294	33,048

Articles and Countries to which exported	Twelve months ended December, 1959	
	Quantity (cwt)	Value (Rs.)
Malaya	213	36,139
Hongkong	10	6,669
Saudi Arab	7	544
Mauritias	15	1,853
Fish dried salted.		
U K.	2	520
France	..	132
Ceylon	2,75,259	2,63,24,111
Malaya	13	708
Saudi Arab	7	1,227
Nepal	..	8
Mauritius	28	3,034
Fiji Is.	13	1,790
Shark fins Fishmaw Similar fish parts		
U.K.	1,831	8,08,233
Singapore	3,293	9,49,935
Malaya	28	5,616
Hongkong	206	1,18,775
Japan	7	1,820
	5,365	18,84,379
Other sorts		
Kuwait	2	206
Ceylon	182	12,121
Singappre	12	1,350
Saudi Arab	4	660
	200	14,337
		4,25,58,604
031 03 Crustacea and molluscs fresh chilled frozen salted dried or frozen salted dried or simply cooked		
Crustacea excl prawn		
France	56	35,098
Switzerland	..	20
U.S.A.	1,363	2,89,073
	1,419	3,24,191

Articles & Countries to which exported	Twelve months ended December, 1959. Quantity (cwt).	Value (Rs.)
Prawns		
U.K.	21	6,568
Malta Gozo	3	1,617
Sweden	3	1,447
Netherlands	70	20,605
France	188	66,163
Switzerland	2	770
Italy	81	22,587
Cyprus	7	4,250
Aden	6	4,758
Behrein Is.	45	10,300
Kuwait	118	17,240
Ceylon	35,502	37,27,340
Singapore	3,803	5,79,546
Malaya	468	70,176
Hongkong	8244	11,32,478
Saudi Arab	189	28,764
Burma	32,929	42,96,554
China	36	5,735
Nepal	1	502
Ghana	..	28
Rhodesia S.	6	926
Kenya	35	6,895
Uganda	..	105
Mauritius	1,488	2,81,882
Bel Congo	1	155
Mozambique	8	5,017
Canada	36	12,970
Br. Guiana	18	3,493
U.S.A.	19,952	46,75,261
Cuba	85	27,236
FR W Indies	16	5,465
Australia	108	36,070
Fiji Is.	30	13,408
Hawaii	57	23,975
	1,03,555	1,50,90,285
		1,54,14,476
TOTAL 931		5,86,17,988

Articles & Countries to which exported	Twelve months ended December, 1959	
	Quantity (cwt.)	Value (Rs.)
032 Fish and fish preparations canned or not		
032 oI Fish, fish products and fish preparations in airtight containers including crustacea and molluscs		
Crustacea and Molluscsprepn. canned.		
U.K.	—	48
Kuwait	8	1,115
U.S.A.	553	1,88,047
	561	1,89,210
Fish canned Excl Sardines Pilchards		
U. K.	416	1,32,803
Finland	7	4,410
Sweden	197	1,04,292
Germany W	53	33,662
Italy	16	13,289
Greece	40	14,944
Cyprus	3	2,277
Aden	22	12,514
Bahrein Is.	21	9,610
Trcl Oman	4	813
Singapore	3	1,612
Syria	1	310
Lebanon	16	9,422
Muscat	5	3,697
Saudi Arab	14	9,597
Iraq	5	2,510
Burma	359	51,670
Nepal	..	142
Kenya	40	19,918
Tanganyika	3	1,513
Nyasaland	4	1,467
Mauritius	13	7,007
Mozambique	14	8,268
Ethiopia	3	1,640
Canada	598	2,93,286
Barbadas	3	1,660
U.S.A.	4,830	13,57,686
Venezuela	10	6,422
	6,700	21,06,445

Articles & Countries to which exported	Twelve months ended December, 1959 Quantity (cwt.)	Value (Rs.)
Sardines and Pilchards canned		
Nepal	..	68
Mozambique	34	19,762
	34	19,830
Other sorts		
U.K.	2	370
Switzerland	1	152
Aden	7	3,964
Kuwait	3	815
Trcl Oman	2	700
Saudi Arab	4	660
Iran	..	88
Nepal	2	399
Kenya	4	1,042
	25	8,190
		23,23,675
032 02 Fish, fish products and fish Preparations not in Air-tight containers including crustacea and molluscs.		
Paste fish crustacea and Molluscs		
U.K.	..	13
		13
Fish prodt. prepn. not canned		
U.K.	1,114	42,798
Netherlands	289	6,326
Greece	40	12,068
Aden	4	642
Bahrein Is.	4	750
Kuwait	11	1,984
Trcl Oman	7	1,380
Singapore	558	6,526
Malaya	1,894	32,420
Saudi Arab	13	2,648

Articles & Countries to which exported	Twelve months ended December, 1959 Quantity (cwt.)	Value (Rs.)
Burma	4	1,550
Rhodesia N	1	225
,, S	1	224
Zanzibar	1	111
Kenya	6	850
Libya	2	536
U.S.A.	18	5,000
Australia	2	618
	3,969	1,16,656
		1,16,669
		24,40,344

081 04 Meat Meal including Tankage and Fish meal

Fish Meal

U.K.	50	24,134
Germany W	631	2,28,488
Netherlands	522	2,04,645
Ceylon	144	38,763
	1,347	4,96,031
		4,96,031

271 Fertilisers crude

271 01 Natural fertilisers of animal or vegetable origin not chemically treated

Fish Fertilisers

Kuwait	3	1,105
	3	1,105

Guano

U.K.	736	3,74,20
Germany W	375	1,79,45
Netherlands	205	1,05,141
	1,316	6,58,799
		6,59,904

Articles & Countries to which exported	Twelve months ended December, 1959	
	Quantity (Cwt.)	Value (Rs.)
411 Animal oils and fats Oils from fish and marine animals		
Shark Liver oils Comml quality		
U.K.	2	400
	2	400
Others		
Bahrein Is.	982	30,994
Kuwait	864	19,910
Trcl Oman	2,088	50,372
Maldives	7	450
Muscat	96	2,486
Saudi Arab	94	3,575
Iraq	516	18,642
Iran	13	280
	4,660	1,26,709
TOTAL		1,27,109
672 03 Natural and cultured pearls unworked		
Pearls Natural		
Ceylon		4,249
Iran		12,479
China		22,100
		38,828
672 04 Natural and cultured pearls worked but not set.		
Pearls real worked		
Netherlands		42
Kuwait		4,717
Ceylon		7,548
Iraq		21,108
Iran		65,170
		98,585

Articles & Countries to which exported	Twelve months ended December, 1959	
	Quantity (Cwt.)	Value (Rs.)
Pearls cultured worked		
Singapore		24,095
Syria		5,017
		29,112
		1,27,697

(ii) *Import for the year ending 31st Dec., 1959.*

Articles and countries from which imported	Twelves months ended December, 1959	
	Quantity (Cwt.)	Value (Ks.)
031 Fish fresh or simply preserved		
031 01 Fish fresh chilled or frozen		
Hilsa live or dead		
Pakistan E.	78,795	86,52,086
	78,795	86,52,086
Fresh fish live or dead others.		
U.K.	13	4,113
Germany W.	..	80
Pakistan W.	1,309	94,264
Ceylon	1,92,037	1,86,13,740
Singapore	2	595
Hongkong	1	156
China	2	310
	1,93,364	1,87,13,516
Bangdas Wet Salted		
Pakistan E.	279	29,191
	279	29,191
Soormai Wet salted		
Pakistan E.	10	1,120
Saudi Arab	4,870	3,33,608
	4,880	3,34,728

Articles & Countries from which imported	Twelve months ended December, 1959	
	Quantity (Cwt.)	Value (Rs.)
Other Fish wet saletd		
Pakistan W.	20,184	7,38,647
Pakistan E.	8,318	7,05,569
Ceylon	47	1,411
Saudi Arab	55	1,095
	28,604	14,46,722
		2,91,76,243
031 Oz Fish salted dried or smoked but not further prepared.		
Bomlas dry unsalted.		
Pakistan E.	2,709	2,15,132
	2,709	2,15,132
Fish dried unsalted		
Other sorts.		
Germany W.	..	63
Pakistan W.	123	3,102
Pakistan E.	1,427	93,305
Hongkong	23	3,115
Muscat	5,643	1,12,967
Saudi Arab	1,741	34,935
Japan	..	113
	8,957	2,47,600
Fish cured		
Pakistan E.	15	999
	15	999
Fish dried salted		
U.K.	7	1,795
Sweden	1	112
Netherlands	2	244
Pakistan W.	12	366
Pakistan E.	4	400
Singapore	..	5

Articles and Countries from which imported	Twelve months ended December, 1959. Quantity (cwt.)	Value (Rs.)
Hongkong	3	242
Iraq	..	10
Japan	..	161
	29	3,335
Fish smoked		
U.K.	3	5,249
Germany W.	4	998
Japan	2	489
	9	6,736
Shark fins fishmaw Similar fish parts.		
Maldives	33	2,404
Hongkong	5	2,130
Japan	..	376
	38	4,910
Other sorts	..	130
Hongkong		130
		4,78,842
TOTAL 03		2,96,55,035
032 Fish and fish preparations canned or not		
032 01 Fish fish products and fish preparations in airtight containers including Crustacea and Molluscs		
Fish canned Excl Sardines Pilchards		
U. K.	390	45,481
Sweden	2	602
Norway	..	27
Denmark	4	2,043
Germany W	13	1,411
Italy	3	1,332
Hongkong	14	2,975
Japan	11	2,009
Canada	113	58,182
U.S.A.	5	1,483
	555	1,15,545

Articles and Countries from which imported	Twelve months ended December 1959. Quantity (cwt.)	Value (Rs.)
Sardines and Pilchards canned		
Sweden	..	58
Norway	406	60,711
Germany W.	6	556
France	1	501
Portugal	14	1,507
Japan	2	199
	429	63,532
Other sorts		
U. K.	5	1,298
Norway	114	13,219
Denmark	2	998
Germany W.	..	75
Nepal	1	30
	122	15,620
		1,94,697
032 02 Fish fish products and fish preparations not in airtight containers including crustacea and Molluscs		
Sauces fish crustacea and Molluscs		
U. K.	9	1,082
Hongkong	3	209
	12	1,291
Fish prodt. prepn. Nes not canned		
Sweden	..	56
Denmark	..	93
Germany W.	4	2,530
	4	2,679
		1,98,667
411 Animal oils and fats		
411 01 Oils from fish and marine animals		
Cod-liver oil in other containers		
U. K.	706	48,847
Netherlands	395	25,643
	1,101	74,490

Articles and countries from which imported	Twelve months ended December 1959	
	Quantity (cwt.)	Value (Rs)
Sperm oil		
U. K.	1,181	87,044
Sweden	9	650
Norway	357	24,266
	1,547	1,11,960
Whale oil crude		
U. K.	57	4,035
Netherlands	58	4,073
	115	8,108
Others		
U. K.	371	24,184
Germany W.	..	90
Switzerland	1	20
Trcl Oman	..	12
Iraq	..	20
Australia.	160	17,705
	532	43,031
TOTAL	3,295	2,37,589
672 03 Natural and cultured pearls unworked		
Pearls natural		
U. K.		11,347
Bahrein Is.		13,79,715
Kuwait		1,43,547
Trcl Oman		2,26,463
Hongkong		24,772
Muscat		85,130
Saudi Arab		26,818
Japan		16,44,090
U.S.A.		3,650
		35,45,532

Articles & countries from which imported.	Twelve months ended December 1959	
	Quantity (cwt)	Value (Rs.)
Pearls cultured		
Switzerland		17,724
Kuwait		42,793
Hongkong		1,300
Japan		18,44,956
		19,06,773
		54,52,395
67204 Natural & cultured pearls worked but not set.		
Pearls cultured worked		5,481
Japan		5,481
TOTAL 672.		71,56,512

FISHERIES DEVELOPMENT IN THE STATES

(i) Fisheries development in Orissa

The Directorate of Fisheries, Orissa in cooperation with the Community Development Department conducted an evaluation of fish production in C.D. Blocks of Orissa in 1960. 177 C.D. Blocks are functioning effectively out of which stocking operations were taken up in 105 blocks upto February 1960, and the proposal is to cover 130 blocks in 1960-61. The area covered upto end of February 1960, was 7,527 acres as against a programme of 11,040 acres in 1960-61. Stocking of fingerlings from the Fisheries Department in 1959-60 was 81,21,852 in addition to certain quantities purchased from private trade.

The Gram-Panchayats which have been the main agencies of taking up pisciculture made an income of Rs. 1,62,882 in 1959-60 as against Rs. 1,33,293 in 1958-59 mainly from lease value obtained from tanks stocks by them.

Experiments conducted by the Directorate of Fisheries in order to assess fish production and yield per acre according to the quantity of fry stocked showed that the average yield per 1000 fingerlings varies from District to District and that nearly 22,640 mds. of fish was produced with an approximate value of Rs. 14 lakhs. The average yield in this State ranged from 100 lbs. per acre to 300 lbs which is considered reasonable as no preparation of stocking tanks was made and the tanks were only stocked with small fry ranging in size between $1\frac{1}{2}''$ to 2 inches without any intermediate rearing operation. In selected panchayats with rearing operations in Ganjam District the average production has ranged between 600 to 1000 lbs. per acre per annum and in two panchayats in Ganjam and Puri Districts an yield of over 2000 lbs. per acre have been reported.

Impact of fish culture has been felt in almost all the blocks and the present proposal is to divert nearly 50 lakhs rupees to fishculture from minor irrigation where facilities for minor irrigation are not available. A provision of Rs. 50 lakhs each has been made in C.D. Blocks and Gram Panchayat Department for fisheries in the III Year Plan and Government are now considering appointment of Extension Workers in fisheries in every block.

(Director of Fisheries, Orissa)

(ii) **Supply of fry in 1959-60 by the Orissa Fisheries Department and estimated production**

District	Fingerlings supplied	Production rate per 1000 fingerlings	Production in lbs.	Value @ 0·75 nP. per lb
				Rs. nP.
Cuttack . . .	5,48,000	@ 150 lbs. per 1000	82,200	61650·00
Puri	7,80,000	@ 50 lbs. per 1000	38,900	28250·00
Balasore . . .	8,65,000	@ 50 lbs. per 1000	43,250	32437·00
Ganjam . . .	24,60,000	@ 200 lbs. per 1000	4,92,000	269,00·00
Mayurbhanja . .	3,70,000	@ 50 lbs. per 1000	18,500	13875·00
Keonjhar . . .	6,48,000	@ 150 lbs. per 1000	97,200	72900·00
Phulbani . . .	1,88,000	@ 100 lbs. per 1000	18,800	14100·00
Sambalpur . . .	28,16,000	@ 150 lbs. per 1000	4,22,400	3,16,800·00
Kalahandi . . .	11,00,000	@ 150 lbs. per 1000	1,65,000	1,23,750·00
Bolangir . . .	14,37,000	@ 150 lbs. per 1000	2,15,550	1,61,662·50
Koraput . . .	6,47,000	@ 150 lbs. per 1000	97,050	72,787·50
Sundergarh . . .	11,93,000	@ 75 lbs. per 1000	89,475	67,106·25
Dhenkanal . . .	15,22,000	@ 50 lbs. per 1000	76,100	57,075·00
TOTAL . .	1,45,74,000		18,56,525	13,92,393·75

(Director of Fisheries, Orissa).

(iii) **Progress of G.M.F. Fisheries Schemes in Madras State for 1958-59**

During the year 16 schemes were implemented and Rs. 16.33 lakhs were spent against the provision of Rs. 21.24 lakhs. The fish production rose to 1,13,580 tons in 1958-59 against 1,07,300 tons in 1957-58. The per capita consumption of fish also increased from 11.3 lbs. to 11.4 lbs.

Under the scheme for assisting fishermen cooperative societies for marketing, purchasing fishery requisites etc., 3204 fishermen of 74 Cooperative Societies were given a loan of Rs. 6.55 lakhs. Through the salt subsidy scheme at 19 fish curing yards 1755 tons of salt were supplied at subsidised rates and 6226 tons of fish cured.

30 Pablo boats were constructed and supplied with other fishery requisites to fishermen cooperative societies. Steps were taken to establish a boat building yard and 2 Fishing Harbours.

Considerable attention was paid to the development of inland fisheries resources by intensifying collection and distribution of fish seed for stocking departmental and private waters. In C.D. and N.E.S. Blocks demonstration centres were organised and 3 crores of fingerlings were collected and distributed.

For developing brackish water fishery an esturine fish farm was established in Adyar. The construction of building for ice and cold storage plant at Tuticorin and Mettur Dam was in progress. Vehicles were hired to transport fish. Six municipalities and two Panchayats were helped to improve fish markets. Twenty fishermen were trained in modern fishing with mechanised boats.

(Food and Agriculture Department, Govt. of Madras.)

(iv) Fisheries in Manipur

A separate Fisheries Department has been set up in 1959 under the charge of a Chief Fishery Officer. Two lakhs of Major Carp fry imported from Calcutta were distributed to pisciculturists. Fry of Mirror Carp were also procured from U.P. and Himachal Pradesh for stocking the inland waters of the Territory.

New demonstration-cum-distribution fish Farms have been opened at Chingaren and Ningthoukhong with 35 nursery tanks, 11 rearing ponds, and 3 stocking tanks with necessary staff quarters, office etc. The fish farm at Wangval has been consolidated with the excavation of 2 stocking tanks. Steps are being taken to open another demonstration-cum-distribution fish farm at Imphal and to produce fish seeds locally by means of Induced breeding methods.

(Chief Fishery Officer, Manipur).

(v) Fisheries Schemes in Bihar

During the Second Five Year Plan about 5·4 crores of fish seed have so far been distributed and stocked in tanks and ponds for intensive fish production. 89 Government tanks and ponds covering a water area of about 250 acres have been transferred from the Revenue Department to the Fisheries (Agriculture) Department for improvement and pisciculture and are being stocked with fish seed. Government have issued orders for transferrence of all still-water areas in the State to the Fisheries Department according to a phased programme.

Four large lakes in Hazaribagh covering over 50 acres have been taken up by the fisheries Department and one lakh of fish fry are being annually stocked and regularly exploited.

Mokomah Bridge Lagoon covering a water area of over 100 acres has been taken up for intensive fisheries development and stocked with one lakh of fingerlings during 1959-60.

The fisheries of rivers of Sone and Burhi Gandak are being regulated with a view to the conservation of brood and seed fish resources.

Two lakhs of fish seed are annually collected for the canal zone for stocking the canal docks. Arrangements are also being made to start Carp breeding farms in suitable areas of Chota Nagpur for induced breeding of Carps to meet the shortage of fish seed of this region. Under a scheme of fisheries Welfare Elementary Fishery schools have been started in each district.

Fish merchants at important assembly centres and markets of the state are being educated in hygienic methods of icing, grading, packing and transport of fish. Efforts are also being made to improve the retail fish markets in cooperation with municipalities. Regular statistics of fish prices etc., are being collected to study the trends of fish supply and consumption in the State.

Each N.E.S. block is being supplied with a set of fishery exhibits for demonstration and propaganda work and fishing nets for greater exploitation of the inland fisheries. Demonstration on manuring of tanks and paddy-cum-fish culture are being given in each block.

Five N.E.S. blocks have been selected in five ranges of the state for intensive development of fisheries. Fish seed have been stocked in selected waters and these blocks and fishermen provided with fishing nets and equipment.

(Fisheries Development Officer, Bihar, 9-3-1960).

(vi) Fisheries Activities in Maharashtra State

The fishing season during the first quarter of 1960 was satisfactory except for some reduction in the landings of Bombay ducks, *Harpodon nehereus.* Loans and subsidies amounting to Rs. 14·43 lakhs were granted by the Government to groups of fishermen for mechanization of fishing crafts. 116 fishing boats were mechanised and 24 new boats constructed by fishermen with Government's assistance. The Ice factory and cold storage built by a cooperative society at Versova, Greater Bombay, with financial assistance from the Government has gone into operation. A loan of Rs. 40,000/- was granted to a fisheries co-operative society at Satpati for building an upto date Boat Building Yard.

Over a lakh of fingerlings of Major carps were stocked in inlandwaters in the State during the first quarter of 1960. An additional area of 9873 acres was surveyed to ascertain suitability for pisciculture. A remarkable instance of high fish yield was reported from Thana where a tank of 15 acres realised a lease value of Rs. 9,000/- for a year's fishing rights.

The Nagpur Municipal Corporation was granted a loan of Rs. 30,000/- being part of the cost of a fish market proposed to be built in Nagpur city.

The Fisheries Technology Laboratory of the Fisheries Deptt. produced 11,588 gallons of Sharkovit of Vitamin 'A' potency 1,000 I.Us. & Vitamin 'D' potency of 100 I.Us. 7·86 lakh Elasmin Pearls, 2,029 lbs of sharkomalt of Vitamin 'A' potency 12,000 I.Us. & Vitamin 'D' potency 2,400 I.Us. & 693 gallons of veterinary grade shark liver oil among other products.

(Director of Fisheries, Maharashtra, July, 1960).

MARINE FISHERIES RESEARCH

Fishery Biology

(i) *Studies on the maturation and spawning habits of some common clupeoids of Lawson's Bay, Waltair*

Clupeoid fishes, chiefly represented by the Sardines (*Sardinella* Spp.), the whitebaits (*Anchoviella* spp.) the Anchovies (*Thrissocles* spp.) and the Rain-

bow sardines (*Dussumieria* spp.) form an important fishery at Lawson's Bay, Waltair, constituting about 37·5 per cent of the total catch.

Spawning habits of six species of clupeoids are given as determined by the ova-diameter measurements from the ovaries, mature or in advanced stage of maturity. Spawning periods for different species based on the occurrence of mature fish or fish in the penultimate stage of maturity are given. The six species of fishes exhibit three types of spawning. (i) *Sardinella gibbosa* and *Thrissocles mystax* have a spawning period of short duration, each fish spawning only once in a season (2) *Thrissocles dussumieri* and *Dussumieria hasselti* have a prolonged spawning period, each individual spawning more than once in a season. (3) *Anchoviella commersonii* and *Anchoviella heterolobus* spawn throughout the year but intermittently.

[(Miss) M. Dharmamba. Indian Journal Fisheries. Vol. VI, No. 2—Oct., 1959].

(ii) *Growth studies of Koth (Otolithoides brunneus Day) from off shore fisheries of Saurashtra-Bombay region*

Scales of 'Koth' collected during 1958-59 shows that there is agreement between the lengths at ring formation calculated from the scales and the modes of length frequency pattern. The mean sizes of fish for the first, second and third rings as calculated from the scale data are 425, 635 and 764 m.m. respectively. The length frequency distribution of 261 specimens sampled from the New India Fisheries Bull trawler landings in Februarv-March 1959, where most of the sizes in the 200-1400 m.m. range were represented, shows modes at 375/425, 625 and 825 m.m. The discrepancy between the values of length frequency modes and these of scale rings is probably owing to sampling error and the relatively smaller number of specimens studied. However, from the general study there are indications to show that the rings are true annuli. The progressive increase in the number of scale rings with increase in fish size is very clear, with a record of 12 annuli in one fish of 1490 m.m.

435 specimens, ranging in size from 130 to 1370 m.m. were measured for length frequency studies. The length frequency distribution of 'Koth' from local 'Dol' net catches showed a single mode of 175, 225 and 325 m.m. in the months of October, November and December, 1959 respectively. A single sample from the New India Fisheries off shore catches showed these modes at 575, 875 and 1025 m.m.

(Central Marine Fisheries Research Station Mandapam).

HYDROBIOLOGY

(ii) **A study of the Copepods of the Inshore Water of Palk Bay and Gulf of Manner**

In order to study the causes which bring about fluctuations in the population of copepods at two stations in the Gulf of Mannar and Palk Bay a detailed analysis of the composition of population and the behaviour of the dominant species was taken up. This paper deals with a detailed study of the composition of the population and the behaviour of the dominant species of copepods in the Gulf of Mannar and Palk Bay.

It is observed that the species which contributed to the bulk of the copepod stock were same at both the stations and the differences in the modes of fluctua-

tion of the total copepods between them were due to the differences in the occurrence of copepodites and to the diversity of patterns of distribution of the individual species. Details of the distribution patterns of the important species are given.

The spawning activity of the copepod populations of the two stations, as indicated by nauplii and copepodites, was also different during the three years. Intensity of spawning appears in general, to be high at Station P, where during May-September the nauplii and copepodites reached numerically high magnitudes.

(Krishna Kartha, K. N., Indian Journal of Fisheries Vol. VI No. 2—Oct., 1959).

INLAND FISHERIES RESEARCH

(i) *Weed Control Experiments*

The use of free ammonia in the eradication of aquatic weeds yielded very satisfactory results. Field trials in the use of ammonia were conducted in several fish ponds in Orissa. By the use of ammonia it is possible to combine three different operations in fish culture, *viz.* weed killing, removal of unwanted population of fish and prawns and fertilization of the pond water. This method has proved to be economically sound for Indian conditions and it is proposed to use this method on large scale control of aquatic weeds. It was observed from the experiments that an area of 0·25 ha. (0·57 acres), 1·52 meters (5 ft.) deep, fully choked with submerged weeds was completely cleared with 34 kg. (75 lbs.) of the gas, supplemented by 36 men hours of labour to clear up the remnants of the killed weeds. The economics of this treatment works out to Rs. 490:00 nP. per ha. The cost of this method appears to be much cheaper than the other mechanical and chemical methods of weed control.

(Central Inland Fisheries Research Station, Barrackpore).

(ii) **Chilka Lake Investigation**

The intensive tagging programme in regard to the commercially important Chilka mullet, *M. cephalus,* launched in the later part of the year 1959 continued to yield recoveries of tagged fish throughout the quarter of January to March 1960. The table below presents the summary of tagging done and recoveries so far made.

Name of fish	Number tagged in season Sept-Dec. 1959	Number recovered in					Total recoveries upto 31-3-60	Percentage of recovery
		Nov. 1959	Dec. 1959	Jan. 1960	Feb. 1960	March 1960		
Mugil cephalus . .	2355	59	75	47	2	5	198	8·4%

The sizes of *M. cephalus* tagged were such that the females among them were, on the basis of earlier observations, not expected to migrate to the sea for breeding whereas some of the males were expected to do so. Of the 198 *M. cephalus* recovered one specimen (Dried specimen was actually observed;

reported ripe male) was recovered from the sea adjoining Chilka mouth and the vast majority of the rest from the main body of the lake. An overwhelming majority of specimens recovered in the lake from January, 1960 onwards are immature females indicating their stay in the lake and confirming earlier work of the Unit. The recovery of one ripe male in the sea at least partly confirms the earlier observations on breeding migration of the species. Data on growth rates and other aspects of population dynamics are being analysed.

(Chilka Investigation Unit, Balugaon, C.I.F.R.S., Barrackpore.)

FISHERIES TECHNOLOGICAL RESEARCH

Craft Branch of the Central Fisheries Technological Research Station

Till very recently there has been no directed effort at coordinating work in boat development for the whole of India. Each state has worked on a multitude of schemes independently and only slowly did boats get accepted in other states than the one they were primarily designed for. To make coordinated work in this line possible, Government of India decided to add a full craft branch to the Central Fisheries Technological Research Station.

Basically, the Craft Branch should ultimately develop into an All-India clearing house for information regarding fishing vessels. It should then be in a position to give information on any specific query, to advise on any question pertinent to fishing boat design or construction, and, to assist in planning of fishing vessels for any particular purpose on any locality in India. The advice of the office is available to all individuals or organisations interested in fisheries, but primarily to the State Departments of Fishery. Due to the centralisation of all fishing boat work in one office, it will be possible to accumulate a wealth of information and knowledge on the subject, which will make the Craft Branch a true collector and disseminator of technical information. State Departments of Fishery and their own technical organisations will gain tremendously by closely associating themselves with the work of the Craft Branch.

To accommodate all aspects of fishing boat development work, the Craft Branch will ultimately be organised in three sections :—

(i) A boat design section.

(ii) A marine engineering section.

(iii) A boat building and extension section.

The boat design section is already established and working on a number of design problems; the marine engineering section will be established shortly, and it is hoped that it will start functioning immediately as a training unit for diesel machinics and fishing boat operators. The boat building section has been in operation for some time and it is now becoming a permanent feature of the Craft Branch. The main task of this section will be to conduct training courses for boat building carpenters, making them familiar with modern boats and their constructional details. It will also act as the experimental boat building unit, trying out new designs intended for standardisation of fishing fleets.

Three training courses in small boat design conducted by this section is an outstanding achievement. On the design side, the branch has now perfected the well known designs for a 25 ft. open fishing boat and the 30 ft. coastal fishing

boat. The branch has also produced prototype designs for 32 ft., 36 ft., and 40 ft. shrimp trawlers, all of which will be built in one or more places during the coming months. A major project handled by the branch in the last year was the development work connected with the design of a beach landing craft suitable for surf beaten beaches in India. The design section is at present working on a number of design studies for vessels to be built during the Third Five Year Plan for the Government of India off-shore Fishing Stations.

Projects at hand for the near future include the preparation of a completely new design for a 30 ft. boat and for a boat of similar dimensions but extremely low draft for work in back waters and shallow estuaries. The Branch attend to a steady stream of enquiries and small research projects and advice is given to an ever increasing number of individuals interested in getting boats built. The research project comprise the study of the resistance to marine borers and marine foulers of a multitude of materials used in boat building with a view to suggesting suitable remedial measures. The branch is also actively engaged in having all its designs tested in a model testing tank, to be able to take fullest advantage of the insights into the behaviour of small ships to be gained from such experiments.

(Central Fisheries Technological Research Station, Cochin.)

FISHING CRAFT.

(i) **New Vessel for the Government of India, Off-shore Fishing Fleet.**

The Third Five Year Plan calls for greatly increased activities of the Government of India Deep Sea Fishing Fleets and consequently it will become necessary to procure or construct a number of new deep sea fishing vessels during the Plan period.

The Fishing Boat Design Section of Central Fisheries Technological Research Station is currently engaged in conducting a world-wide survey of medium size trawler designs, as well as drawing up a number of proposals of its own.

Three main size groups of trawlers are being studied; 75 ft., 100 ft., and 125 ft., length over-all, both conventionally arranged as side trawlers and also laid out as modern stern trawlers. The study will also be extended to wooden shrimp trawlers of 50-60 ft., length over-all, as well as Tuna long line vessels and fish carrier boats. In order to be able to follow the latest developments in trawler design abroad, the Section had to establish contact with some 35 shipyards specialised in building these size of trawlers, as well as establishing contacts with numerous manufacturers of trawler equipment, ranging from main propulsion engines to deck gear, such as trawl winches, and electronic fishing and navigation aids.

The emphasis in the Section's own design studies is squarely laid on the possibility to build all the ships in Indian Shipyards and to use equipment and gear by Indian manufacturers as far as possible. It is most encouraging to note that it seems to be possible to equip the planned ships almost entirely with marine engines made in India.

While the Section is not attempting at this stage to present full working drawings of such a vast variety of vessels, it is nevertheless basing each type on an advanced lines plan, making full use of published model test results and the

valuable material contained in the proceedings of the two World Fishing Boat Congresses conducted in 1953 and 1959 by FAO. It may be expected, therefore, that the design studies prepared by the boat design Section will incorporate a number of revolutionary ideas that are fastly gaining ground in the fishing fleets of the world's leading fishing nations.

(Central Fisheries Technological Research Station, Cochin.)

(ii) 25′ Open Fishing Boat

With the recent introduction of this new, small boat into India's inshore fishing fleets, the unending effort to find a suitable small boat for the vastly expanding inshore fishing industry seem to have met with success. The boat was designed by the F.A.O. Naval Architect attached to the Central Fisheries Technological Research Station and in its latest form is becoming rapidly popular with fishermen along the east and west coasts of peninsular India. Substantial numbers of the boat are being built now in Mysore, Kerala, Madras and Andhra Pradesh and the few that have already been completed mainly in Kerala, are fishing with good success.

The boat shows greatly improved performance in hard seas as are met at the onset of the monsoon season on the Kerala coast. The boat proved to be comparatively dry in the short and steep seas encountered and her stability is excellent. The hull is of very low resistance form which makes it possible to achieve considerable speed with only 10 B.H.P., while the thrust developed by the propeller is sufficient to even allow trawling for shrimps with small trawl nets. It is entirely possible to fit an engine driven net or line hauler in the forward cockpit and thus make the little boat a fully mechanised fishing tool.

No great problems arise for the builder of the boat. The construction is simple and all the same rugged, and the boat is built at about the same price level as the well known cruiser stern 'Pablo' boat of 24 ft. 7 in. over-all length. Yet this 25 footer will be much roomier and easier in the sea.

Boats of this design are currently engaged in a number of fishing methods. On the Kerala Coast they mainly trawl for shrimp, while on the Madras and Andhra side the main methods are drift netting and bottom set net fishing. Long lines are also being used with some of the boats, notably in the Laccadive and Minicoy Island area.

The Craft Branch took performance trials of the delivered boats at Cochin. An account of the trials with the boat "K 16" is given below:—

Main Dimensions

Boat		*Engine*
Length overall	25 ft.	Make: Petter AV_2 RMR_2: 2·1
Length datum wl.	23 ft.	Power: 10 B.H.P.
Beam maximum	7 ft. 2 in.	R.P.M. : 1500
Beam datum wl.	7 ft.	Propeller: 17 in./15 in. 3 bladed at 750 r.p.m.
Draft max.	2 ft. 6 in.	
Desplacement datum wl:	2·8 tons	

Trial Conditions

Completely equipped hull with $\frac{3}{4}$ ton load on board but no fishing gear and catch. Distance run measured 1480 ft. in Cochin Harbour.

Run	R. P. M.	Time (Sec.)	Mean (Sec.)	Speed (knots)	Power
Up	1490	150	138	6·35	Full
Down	1490	125			
Up	1360	159	143	6·13	3/4
Down	1360	126			
Up	1190	178	156	5·62	1/2
Down	1190	133			

The time taken to turn the boat through a full 360° at full power was 24 Sec. and turning circle diameter about $1\frac{1}{2}$ boats lengths to either side. The time taken and the corresponding distance covered when stopping the boat from full ahead by utilising the reverse gear arrangement were 12 Sec. and 2 lengths respectively.

(Central Fisheries Technological Research Station, Cochin).

Central Fisheries Technological Research Station—Fishing Gear Branch

The main aim of the Branch is to conduct investigations leading to the development of fishing gear scientifically and systematically. The Branch consists of 3 sections, namely, (i) Gear material section, (ii) Gear design section, and (iii) Fishing methods section. The work undertaken in the various sections could be summarised as follows:—

1. Testing of material both locally made and imported; endeavouring to improve locally made fishing yarn by correct stranding, twisting, pre-treatment etc. and advising the industry on the proper selection of material to suit particular type of fishing.

2. Treatment and preservation of fishing nets, testing the suitability of locally available and imported preservatives and advising the industry on the proper care and treatment of fishing equipment.

3. Testing the efficiency of local fishing gear and methods by experimental and comparative fishing; endeavouring to improve their effectiveness and introducing such foreign equipment and practices as might prove effective under local conditions; modifying this gear as needed and demonstrating its proper use to local fishermen.

4. Collaborating with fishing boat development stations and boat builders in introducing power driven winches and other equipment for efficient handling of the gear.

5. Experimenting with and advising the local industry on the proper selection of suitable methods and equipment for locating and detecting fish (navigational aids, echo sounders) as well as equipment and methods for attracting fish (light fishing).

(Central Fisheries Technological Research Station, Cochin).

FISHING GEAR.

(i) Results of Experiments with a 10 ft. Beam Trawl.

Beam trawls are probably the forerunner to the modern trawling gear. The gear is still in vogue in countries like Japan for capture of prawns.

Prawns form a major fishery along the South-West Coast of India and at present the fishing is restricted to a very limited area. These limitations are mainly due to the types of crafts and tackles that are being employed by the fishermen. Beam trawl is a cheap and efficient fishing gear which can be operated both from a mechanised or a sailing boat. In order to assess the effectiveness of this net in capture of prawns and to work out the possibilities of operating it from small power vessels (which are not suitable for operation of otter and bull trawls) experimental fishing with a 10' Japanese type Beam trawl was conducted and the result are incorporated in this note.

The vessel used for operation was a 30' motorized boat fitted with 30 H.P. semidiesel marine engine and manned by a crew of 4. The dimension of the net and accessories are :—

Net

Name of Part	Mesh Size	Twine used	No. of meshes in length	No. of meshes in Breadth.
Upper Wing	1"	Cotton 32/3/6	70	40
Lower Wing	,,	,,	80	80
Side Wedge	,,	,,	240	80—1
Upper jib	2"	,,	80	1—80
Lower iib	,,	,,	80	1—53
Square	,,	,,	80	240—186
Upper Belly	,,	,,	160	186—80
Lower Belly	,,	,,	160	186—80
Flapper	,,	,,	20	80—40
Cod end	,,	,,	100	160

Net Accessories

Length of head rope	19'
Length of foot rope	27'
Dimension of Beam	10·5'×2½"
Dimension of Trawler heads	2·5'×4"×4"
Length of Bridles	8 fms. (0.75" dia)
Length of tow line (warp)	60 fms. (1" dia).
Cement weight	65 lbs.
Lead Weight for each trawler head	13 lbs.
Total cost of net with accessories.	Rs. 250/-

The net had 10 floats on the head rope and 30 lead sinkers on the foot rope. The free ends of the head and foot rops of either side (spreaders) were tied to the upper and lower ends of the trawl head, which were kept in position by means of a 10′ horizontal beam. Pair of two short bridles of 1 fathom length were tied to the trawl heads to keep them in a vertical position. The main bridles 8 fathoms each were fastened to each of these short bridles and their free ends were shackled to the cement weight and one end of the warp.

The depth of water at the grounds fished ranged between $4\frac{1}{2}$-13 fathoms and the bottom was mostly of soft and or reaching the expected fishing ground sounding was taken for depth of water and the net was paid out from the stern in the order of cod end, beam, bridles, cement weight and warp, which carried distinct marks at an interval of 10 fathoms to facilitate paying of correct length of warp. The length of warp used during trawling was a little over 5 time the depth of water. The trawling speed ranged between 1 to $2\frac{3}{4}$ knots per hour and the duration of the drag was between 30 to 45 minutes. When the drag was completed the engine was stopped or reversed and the net hauled up by hand by the crew. The cod end of the net was hauled up from either the starboard or portside of the vessel.

The particulars recorded in the following table will be helpful in knowing details of the operations and the catches landed by a 10' beam trawl net.

Name of days fished	8
Total Number of hauls taken	39
Number of huals per day	4 to 7
Total duration of hauls	30 hrs. 55 min.
Total Catch of fish in lbs.	646·5
Total Catch of prawns in lbs.	1,181·5
Catch per head per day in lbs.	36·93 (Pr) & 20·21 (Fish)
Catch per hour of trawing in lbs.	38.23 (Pr) & 20·90 (Fish)

(Central Fisheries Technological Research, Station, Cochin.)

(ii) Results of Experiments on the concentration of Tannin solution for the Preservation of Nets

The majority of Indian fishermen use tannin in solution for preservation of the nets. The source of tannin is usually twigs, leaves, barks, and fruits of trees. An important factor that influences the preservative effect of tannin is the concentration of the solution. This aspect of tannin preservation has received significant attention in other countries. But a survey conducted by this Research Station on the concentration of the local tannin baths prepared, has given sufficient evidence that attention is not being paid to this important aspect of fishing gear preservation. Lack of knowledge of the most suitable concentration of the dyeing bath, which is termed as the Optimum concentration' in scientific terminology, deprives the fishermen of the benefit of depriving the maximum effect from the tannin preservatives. The 'Optimum concentration' could therefore, be expressed as the concentration which ensures

the maximum "effective days" of the preservative. The results of the experiments conducted to determine the optimum concentration of English Cutch (Crystal tannin) is indicated below.

The twines used for the experiments were cotton 20 count 3 ply 9 yarns. Twines were treated in solutions of concentrations varying from 1% to 10%. The breaking strengths of the twines after treatment were recorded. The twines were then subjected to continuous immersion in water. The strength of twines were thereafter recorded at an interval of two days. The conventional practice in such experiment is the assumption that the preservative loses its quality when the strength of the treated twines is reduced to half its original value after exposure. Hence the reduction of the breaking strength of a fishing net twine to half its original value is the recommended basis to reckon the "effective days" of a preservative. Assuming, therefore, that *a* and *b* respectively represent the number of days in which the untreated twines and treated twines lose half their original strength, then *b—a* will be the "effective days". Comparisons of the value of *b—a* for solutions of different concentrations help to determine the optimum concentration of the concerned preservative. In the case of cutch solutions of different concentration it was observed that up to a concentration of 4 to 6% effect of the preservation increased sharply but thereafter the effect was in no way commensurate with the increase in the strength of the dyeing bath. Hence it is only reasonable to conclude that optimum concentration of cutch dyeing baths for the preservation of cotton fish net twines ranges from 4 to 6% from the economic standpoint.

(Central Fisheries Technological Research Station, Cochin)

FOREIGN

GENERAL AND DEVELOPMENT

MARINE

(i) Annual Marine fish Catch in Major fish Producing Countries of the World for 1953-58.

Countries	1953	1954	1955	1956	1957	1958
Canada (including New Foundland) . . .	887·6	985·8	921·0	1059·4	949·8	959·8
U.S.A. (including Alaska) .	2364·1	2639·0	2667·3	2885·2	2665·4	2603·3
Japan	4496·6	4513·9	4875·9	4718·9	5357·7	5464·3
Norway	1556·7	2067·9	1812·9	2201·0	1754·4	1415·1
U. K.	1121·6	1069·7	1099·7	1049·8	1014·1	998·4
U.S.S..R.	1509·8	1506·7	1925·0	2127·0	2055·5	2160·8
India	581·5	588·3	595·7	718·7	875·4	755·7

(F.A.O. Year Book of Fisheries Statistics, Vol. IX, 1958)

(ii) Russia Plans 62 p.c. Fishery Increase

A 62 per cent increase in fisheries production is part of the U.S.S.R.'s 1959—65 Seven Year Plan. 1958 production was reported as 2·9 million metric tons, so that 1965 target would increase that total to 4·6 milion tons.

Russia is already the world's second largest fishing country and the 1965 target would still leave her in that position, with Japan in front even on her 1957 catch of 5·4 million tons, which was 12½ p.c. greater than in 1956. The world's third largest country is China whose catch in 1956 was estimated at 2·6 million tons. U.S.A. is fourth with fishery production of one million tons or more. Her 1958 catch totalled 2.1 million tons. The other three nations are Norway with 1·7 million tons. India with 1·2 and U.K. with 1·0. All the totals include all fishery production except whaling, namely, fresh and salt water fish, crustaceans, molluscs etc.

(Fisheries Newletter, August 1959, page 31)

(iii) South Korean fish landings show decrease

In 1958, South Korea's landings of fishery products amounted to 395,000 metric tons, a decrease of 8,000 tons on 1957. Landings of fish and shellfish were up 15,000 tons, but production of seaweed and other products declined about 23,000 tons. Exports of marine products totalled 11,000 tons and were valued at 3·6 million dollars, or about 22 per cent of the dollar value of all exports. In value, chief exports were cuttle fish, fresh and live fish, agar-agar, and seaweed. The principal buyers were Japan and Hongkong.

(World Fishing—September 1959, page 76)

(iv) Method developed to get year round production.

The SO-300 class of seiners built in Russia in 1951 were designed and equipped for purse-seine, stern trawling and drifting operations. Thus more than one type of fish could be caught and also the vessels could operate all the year round.

The stern trawling operation developed off the western coast of Kamchatka and the Northern Kuriles have been described in detail in the article. The use of the method has greatly increased overall catch of the vessels.

(World Fishing, Vol. V, No. 8, Aug. 1959, pp. 63—67)

(v) Review of Canadian Fisheries

The year 1958-59 was one of the most prosperous which British Columbia fishermen have ever had and one of the most adverse ever experienced in Newfoundland. Between these two extremes fishermen in the maritime provinces and on the fresh water lakes had a moderately good season.

The Salmon catch in B.C. was 32 per cent heavier than in the last year and nearly twice as valuable. The income from Halibut and Herring also increased compensating the losses in Newfoundland.

The export increased in value by 24 million dollars to total 159 million dollars. Total export value of canned Pacific salmon increased by 22 million dollars.

Pacific coast Salmon catch of 175 million lbs. had a landed value of nearly 36 million dollars. In Newfoundland trawl fishery was failure, squid did not make their usual appearance, and salt fish production declined by 36 per cent but the fillet production expanded, landings in the maritimes were smaller but more valuable in 1958-59 than in the previous fishing year.

The freshwater fish landings at Ontario amounted to 28 million pounds valued at 3.9 million dollars, being nearly three million pounds heavier than in the previous fishing year. At Great slave lake smaller catch than 1957-58 was produced.

(Trade News, July 1959. pp. 9—11)

(vi) Japanese Plans Atomic Fishing Boat

Japanese plans for building the first atomic powered fishing vessel for experimental purposes were announced at the Second World Fishing Boat Congress at Rome. The vessel will have a displacement of 3,000—4,000 tons and will be powered with an American-type reactor whose heat will be used by a steam turbine. The ship will have a complement of 100, of which 50 will be sailors and 50 research experimenters. Of the research crew, 20 will act as observers and 30 will be responsible for the reactor. For emergency use, a 120 h.p. Diesel will be installed. The Japanese delegate believed that high speed fishing boats driven by reactors would be coming into general use before 1970, and that their atomic energy would be used directly rather than through boilers.

(Fisheries Newsletter, August 1959, page 23)

(vii) Denmark—Fish Meal Production

Production of fish meal in Denmark increased by about 14 per cent from 58,000 metric tons in 1957 to 66,000 metric tons in 1958. This increased production was due to better landings of Herring and sand eel. 22,000 tons went for home consumption in 1958, while 53,000 tons were exported.

In 1958 salted fish production by the Faroe Islands was 29,850 metric tons, or 450 tons more than in 1957. Landings from off the Iceland coast were 7,800 tons, lower than the previous year, but landings from Greenland fisheries were a record of 19,250 tons, against 12,800 tons in 1957.

(World Fishing, September 1959, page 83)

(viii) Marine Oil Production

Marine animal oil production in Canada fluctuates sharply from year in accordance with the success or failure of the British Columbia fishery and seal fishery on the East Coast. In 1958 Canada produced 5.7 million Imperial gallons of marine oils as compared with 3.8 million gallons in 1957 and about 6.2 million gallons in 1956. The increase of about 48 per cent in 1958 over 1957 was due to more landings of Herring in 1958 in B.C.

(Commercial Fisheries Review, Vol. 21, No. 9, Sep. 1959, page 58)

Technology

(i) Fibreglass Gillnetter in use in B.C.

The 34-foot vessel 'Tiara', the first Salmon gillnetter in British Columbia constructed from fibreglass was built in the North Vancouver yard of B.C. The 3/8" hull is reinforced with glassed-in mahogany stringers and bolted on plywood frames. Seven watertight bulk heads will provide enough buoyance to keep it floating if the hull is holed. It is roomy and comfortable. It has a draft of 3' 9" and a displacement of 12,000 pounds. Power is provided by a 165 h.p. diesel. She cruises at 14 knots and at this speed fuel consumption is five gallons per hour. If she proves satisfactorily on the fishing ground, then

hulls constructed of fibreglass may find an excellent future in the B.C. fishing fleet.

(Trade News, August 1959, page 7)

(ii) Crab Picking Machine

A crab picking machine has been developed by the Blue Channel Corporation at Beaufort. This machine gently breaks the crab and then float the particles of meat to the surface of a strong brine solution. From the collecting tank conveyors transport meat which is inspected by attendants and the undesirable pieces are removed. This produces crab meat of pure quality. The crab meat produced by hand labour consisted of cooked mixture of crab meat, bread crumbs, spices etc.

(World Fishing, Vol. 7 No. 8, August 1959, page 53)

(iii) Aureomycin allowed for Fresh Fish

The use of chlortetracyline (Aureomycin) to aid in keeping fresh caught fish and shell fish in sound condition has been authorised by the U.S. Food & Drug Administration in an order setting 5 parts per million as the safe limit that may remain in these foods without harm to the consumer. The order allows commercial fishermen to use chlortetracycline on fresh caught, whole headed and gutted fish, shucked scallops and unpeeled shrimp. It does not allow use of the antibiotic on processed sea foods products, including fish cuts, steaks, fillets, peeled shrimps and shucked oysters.

The chlortetracycline had been used in uncooked poultry since 1955 and extensive data on its safety were available. A minute amount remained in fresh fishery products treated with the antibiotics and was not always removed by cooking. Scientists and Physicians had determined from all available data and feeding tests that this amount of chlortetracycline could be consumed without harm, even by persons who had developed a sensitivity to antibiotics.

The labels of fishery products processed from treated fish must show that the fish contains chlorotetracycline and that it has a preservative effect commercial fishermen will use the antibiotic as a dip or in ice.

(Fisheries Newsletter, July 1959—page 23)

(iv) A method for the Fractionation of Alginates

Alginates are considered to be heterodisperse but no satisfactory method of fractionation has been reported. Attempt to fractionate alginates by adding divalent metal salts are generally unsatisfactory owing to gel formation. Manganous salts on the other hand behave quite differently, and using suitable concentrations, part of the alginate can be precipitated and separated by filtration of centrifuging. The remainder can be precipitated using a higher manganese concentration or another precipitating salt, giving fractions with different properties. In general, the precipitates formed are more soluble in the cold than when heated, and changes in temperature as well as changes in the amount of manganese used could be used for fractionation. Similar results are obtained with ferrous salts.

(World Fisheries Abstracts, Vol. 10. No. 4. July-August, 1959 page 43)

(v) Preservation of fish and fish offal

Surplus fish and offal, at present rejected in several countries, can be put to varied uses if they could be economically preserved for short periods. Investigations on the preservation of Herring and White fish for meal and oil manufacture using sodium-nitric formaldehyde, antibiotic, quarternary ammonium compounds, a bisguanide, sodium metabisulphite, hypochlorities and sulphur dioxide have shown that in every case dipping is preferable to permanent immersion in solution. A solution containing 1 per cent formaldehyde and 1 per cent. sodium nitrite has been found to be suitable for White fish and Herring, intended for conversion into fish meal, from considerations of toxicity, cost and industrial application. Maggot infestation is also prevented by this treatment. The dipping technique is ideal in that it can easily be mechanised and yet every fish can be brought into contact with the preservative solution. Herring dipped for 1 min. in preservative solution can be stored for a month in winter and 12–20 days in summer depending on conditions.

An ingenious continuous dipping process has been worked out. The 250 gal. hopper of a Herring rinser is filled with 125 gal. of 1 per cent. sodium nitrite and 1 per cent formaldehyde solution and then Herring added to raise the level of the solution sufficiently to fill the hopper. After $1\frac{1}{4}$ min., the conveyor belt is started. The slates of the conveyor belt reach up to the bottom of the hopper and effectively remove all the fish in $1\frac{1}{4}$ min. The Herring are then transferred to metal drums with perforated bottoms allowing blood liquors and oil to drain away. The drums are stored in the yard without any protection from the sun. The scum formed on the surface of the dipping solution due to contamination with scales can be easily removed. Blood liquors from fish which remain overnight in barrels alter the concentration of the dipping solutions. The layout should, therefore, include an open sides conveyor belt to allow the liquors to drain away, feeding the fish into the dipping hopper.

In the case of White fish, the amount of preservative required is 2-3 times that for Herring (dipping period 10 min. to keep for 10 days) and it is desirable to blend preserved meal to reduce the residual nitrite content.

(Research and Industry August, 1959, page 211).

(vi) Killing whales with carbon dioxide shells

A new Norweigian invention for hunting whales using carbon dioxide will be tried out in practice in whale hunting off Iceland. The new idea, experimented by a Norweigian engineer, is that when the harpoon hits the whale the shell releases 88 cu. ft. of CO_2 , which spreads through the whales' body and kills it in 2 seconds. It then causes the whale to float to the surface without air having to be pumped into it.

(Commercial Fisheries Review Vol. 21 No. 9—Sept., 1959—page 50).

Trade

(i) Import of fish and fish preparations to Ceylon during 1957–1959

Statement showing the break-down, countrywise of fish and fish preparations imported into Ceylon during the year 1957-1958 and January–July,

1959 and the value of the intake from each of the principal suppliers is indicated below:—

(Rupees (000).

	1957	1958	Jan-July 1959
India	42,083	44,491	24,630
Maldives	9,594	10,997	7,546
Aden	3,220	4,252	3,440
Pakistan	4,199	5,230	7,189
China	88	2,680	231
Japan	1,567	4,916	3,569
U. K.	297	265	152
Canada	188	121	70
S. Africa	2,636	3,553	970
Other countries	16,334	15,818	2,069
TOTAL	80,216	92,323	49,866

The types of fish and fish preparations imported into Ceylon are as follows:—

Quantity: Cwt. (000); Value Rs. (000)

	1957		1958		Jan-July 1959	
	Qty.	Value	Qty.	Value	Qty.	Value
1. Fish, live	6	5	22	10	15	6
2. Fish, frozen or refrigerated	..	52	..	82	..	36
3. Maldive Fish	60	9,906	59	11,142	43	7,810
4. Sprats, dried	94	10,080	139	11,142	43	7,810
5. Other, fish dried but not salted	9	767	4	423	10	1,026
6. Fish, salted and dried	541	52,332	642	53,775	284	25,213
7. Fish, wet salted or brine packed Jadi	7	177	44	1,637	84	2,648
	..	3	..	13	..	53
8. Fish, smoked, marinated etc.	..	32	..	6	..	7
9. Shark fins fish maws.	..	4	..	5	..	3
10. Dried, prawns	19	2,088	16	1,618	7	751
11. Canned Fish	56	4,676	111	9,495	55	4,872
12. Potted or preserved fish	1	92	..	57	..	9
TOTAL		80,216		92,323		49,866

SOCIO-ECONOMICS.

(i) Co-operative Conference

Seventy five delegates from 18 countries and observers from four International Organisations attended the 9 day technical meeting on fishery co-operatives held in Naples in May. The meeting was organised jointly by the Food and Agricultural Organisation and the International Labour Organisation. The countries represented at the meeting were Belgium, Canada, France, West Germany, Greece, Italy, Japan, Netherlands, Norway, Poland, Spain, Sweden, Switzerland, Turkey, United Kingdom, United States, Viet-Nam and Yugoslavia.

Opening the meeting, the Italian Minister of Merchant Marine said that fishermen must organise themselves into cooperatives in order to increase their technical and financial means, must adopt new systems to harvest the biological resources of the sea, and must rationalise their activities, reduce costs and increase their competitive position in the fish market. Dr. D. B. Finn, Director of FAO's Fisheries Division said that it was the first international meeting of the kind. He also said that the discussions will be of interest not only to ourselves but particularly to many people in less developed countries who are confronted with the urgent problems of developing their fisheries. The Secretary General of the Italian Cooperative Federation said that only possible solution to problems confronting producers and consumers was the establishment of Cooperatives. He expressed the hope that Governments will increase their support of Cooperatives without endangering their autonomy and indépendence.

(Fisheries Newsletter July, 1959—page 17).

CONSERVATION AND MANAGEMENT

(i) New Scallop Dredge Banned

The Tasmanian Minister for Fisheries announced in June that a new type of scallop dredge would be banned in D' Entrecasteaux Channel. The regulations could not substantially affect the fishing season. The new dredge is an English type. It has been reported that some destruction of scallops was incidental to fishing, but many fishermen contended that the new dredge noticeably increased it.

(Fisheries Newsletter August, 1959—page 21).

INLAND FISHERIES RESEARCH

(i) The Chemistry of Developing Brown Trout Eyed Eggs and Sac fry

The chemistry of developing eggs and sac fry of brown trout spawning for the first time and second time, both on dry and wet basis was investigated.

The analysis of the results showed that water content gradually increases the protein content of the developing egg and the developing sac fry continually decreases; the fat content of eyed egg on wet basis, gradually increases to the hatching period, after which there is a gradual decrease. The result of ash content are not significant. Total weight of the egg samples does not change through hatching period. After hatching there is a gradual increase in weight of the sac fry. These confirmed Hayes observations.

It has also been pointed out that size is not necessarily a criterion of egg quality, with eggs from different ageis of spawning trout.

(A.M. Phillips, Jr.—The Progressive Fish Culturists—Vol. 21 No. 4 Oct., 1959 pages 161—164).

(ii) Short-Term Storage of Brook Trout Milt

Attempts to apply the well known mammalian techniques of Long Frozen Sperm storage to fish have met with varying degrees of success.

Milt from twelve 2-year old male brook trout was carefully collected by dry stripping method refrigerated with necessary precautions. Test eggs were taken from female trout that had reached full maturity and mixed with stored sperm. The experiment was performed with sperm that was diluted with frog Ringer Solution.

The results indicated that successful hatching could be obtained from refrigerated sperm after 5 days of storage under the simple condition and on each test undiluted sample of sperm yielded the highest number of fry hatched.

(N.E. Henderson and John E. Dewar. The Progressive Fish—Culturist. Vol. 21 No. 4 October, 1959 pp. 169—171).

(iii) Experiments in Hybridizing several Species of Trout

The report is a summary of the experiments conducted on the hybridization of trout between 1952—57. The F generation of 'brookinaw' was obtained by crossing a brook trout female and a lake trout male. The hatching success was 73 per cent., with good survivals. The external characters of male and female of 'brookinaw' have also been noted. Males were brightly coloured.

Hatching success of the F_2 generation averaged 68 per cent. Hatching success of a back-cross with a brook trout male was 94·1 per cent. and that of a back-cross with a brook trout female was 82·2 per cent.

A cross between a 'brookinaw' female and a brown trout male yielded a hatching success of 4·8 per cent; a cross between a brown trout female and a 'brookinaw' male yielded a hatch of 32·2 per cent.

The hatching success of a cross between a lake trout female and a brook trout male was 38·5 per cent.

(Charles L. Sowards—The Progressive Fish-Culturists, Vol. 21 No. 4, October, 1959 pp. 147—150).

FISH PRESERVATION

(i) Fermented Fisheries products

Fish are ground and molasses, starch, sucrose or glucose were added. The mixture is fermented by carbohydrate micro-organisms. The fermented products are used for making sausages, fish meal or paste. The keeping quality of the fish is claimed to be greatly improved by the fermentation.

(World Fisheries Abstracts, Vol. 10 No. 4, July-August, 1959, p. 1).

GENERAL FISHERY NEWS

(i) Boats most costly part of fishing—New FAO book issued.

According to a book published today, "Fishing Boats of the World-2" the investment in fishing boats in highly developed countries runs higher than the investment in harbours, canning plants and retail stores together. A survey by the Canadian Government in 1958 showed vessels accounted for 67 per cent of the total investment in the Canadian fishing industry.

The largest book to be sponsored by F.A.O., edited by Jan-Olof-Traung, Chief of F. A. O.'s Fishing Boat Section, the book is based on the papers and discussion on the Second F. A. O. World Fishing Boat Congress but includes all recent developments in fishing boats, from their design and construction to insurance. It is written in English with French and Spanish abstracts.

Chapters and charts are devoted to dock design, scantlings, fish holds, machinery, costs, sea behaviour, safety at sea, boat types and choosing the right craft for the task. A special feature is a discussion of the fishing boats of 1975.

Among the charts presented is a table showing the principal fishing boat types used in each country. These countries accounted for 92 per cent of the world's fish catch.

Japan has 14 individual major types of fishing boats, followed by the U.S.S.R. with 11 and Norway with 10, the U.S.A. have 9 different major types, the U.K., Canada and Iceland list a total of 7 ship types; Portugal, France, Sweden and India, six each; the Faroes, Germany, the Netherlands and Italy 5; Denmark, Indonesia and the Union of South Africa, 4.

The most popular boat in use is the trawler used by 25 nations. Then comes the drifter, employed by 29 nations, followed by the purse seiner used by 26 nations. The troller is used by 12 nations and the whale catcher by 11.

One of the many subjects covered is the recent trend to stern trawling rather than side trawling. While trawling is regarded as the most advanced method of fishing, book says that other methods are constantly improving. Information supplied by the Japanese show that the use of long-line gear is a productive method of fishing.

The book points out that most boats today are still small—between 80 and 90 ft. in length but too heavy and not costing more than $ 100,000. Generally built of wood, they are constructed on the principle of the thicker the timber the safer the boat. The studies published in the book show Danish boats to be 40 per cent and Swedish boats 30 per cent heavier than necessary. A detailed discussion of a new type of British commercial stern trawler, which recently went into commercial fishing for the first time is included in the volume.

(Food and Agriculture Organisation of the United Nations, 26-5-1960).

(ii) Exploratory Fishing in the Sunderbans

Research and Exploratory Fishing Vessel M.V. "Sunderbans" started preliminary charting and fishing experiments in the Sunderbans. The operations

were started in December when three cruise were made in the lower reaches of Muriganga, Saptamukhi and Thakuran. Initially, an echo-sounding survey was made with a view to ascertain the bottom contours and the possibility of trawling. Even though the river bed is very uneven in many areas, satisfactory trawling grounds were found in Saptamukhi and in the neighbourhood of Frazergunge island. Fishing experiments have been initiated in the area. (Central Inland Fisheries Research Station, Barrackpore).

(iii) **Training in Power Fishing at the Training Centre, Mangalore**

In order to provide trained personnel required for handling the mechanised fishing boats, a training centre was established at Mangalore in 1958-59. 57 fishermen have so far been trained and another batch of 20 trainees are undergoing training. The course include navigation, working of marine Diesel engines, net making, braiding of nylon gill nets, rope splicing, knots and engine operation and practical fishing with different kinds of nets *viz.* trawl nets, gill nets etc.

(Director of Fisheries, Government of Mysore, 23-4-1960).

GMGIPND—DME (NS)—113M.of F.&Agr.—21-12-60—500.

COVER DESIGNED AND PRINTED BY THE MANAGER, PHOTO-LITHO WING,

G.I. PRESS, NEW DELHI.